(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Veröffentlichungsnummer:
(11) Publication number: **EP 1 550 121 A0**
(11) Numéro de publication:

Internationale Anmeldung veröffentlicht durch die Weltorganisation für geistiges Eigentum unter der Nummer:

WO 2004/023484 (art. 158 des EPÜ).

International application published by the World Intellectual Property Organisation under number:

WO 2004/023484 (art. 158 of the EPC).

Demande internationale publiée par l'Organisation Mondiale de la Propriété sous le numéro:

WO 2004/023484 (art. 158 de la CBE).

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
18 March 2004 (18.03.2004)

PCT

(10) International Publication Number
WO 2004/023484 A1

(51) International Patent Classification[7]: G11B 20/12

(21) International Application Number:
PCT/KR2003/001799

(22) International Filing Date:
3 September 2003 (03.09.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10-2002-0053608
5 September 2002 (05.09.2002) KR
10-2002-0056235
16 September 2002 (16.09.2002) KR
10-2002-0056923
18 September 2002 (18.09.2002) KR

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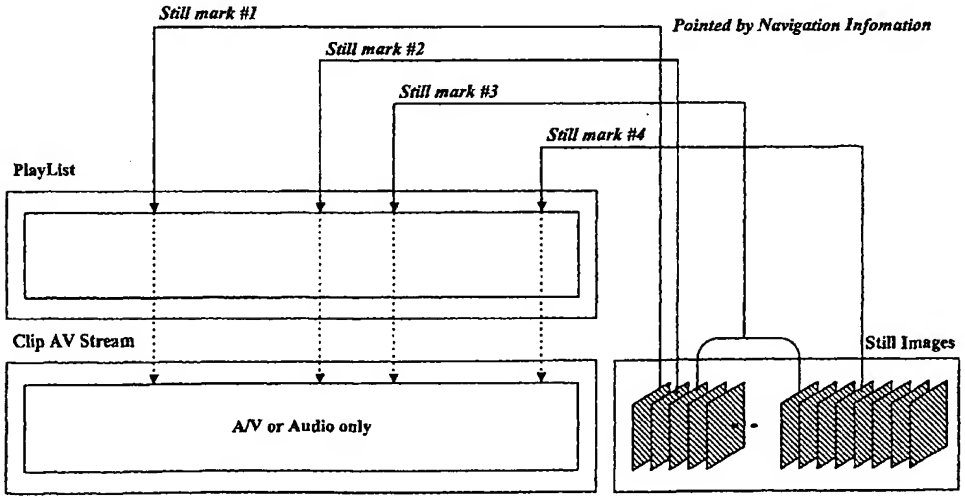
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: RECORDING MEDIUM HAVING DATA STRUCTURE OF PLAYLIST MARKS FOR MANAGING REPRODUCTION OF STILL IMAGES RECORDED THEREON AND RECORDING AND REPRODUCING METHODS AND APPARATUSES



(57) Abstract: In the recording medium, data area stores at least first and second still images and a playlist areas stores at least one playlist. The playlist includes mark information, and the mark information provides presentation information on the first and second images to allow for at least skipping from reproducing the first image to reproducing the second image.

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DESCRIPTION

RECORDING MEDIUM HAVING DATA STRUCTURE OF PLAYLIST MARKS FOR MANAGING REPRODUCTION OF STILL IMAGES RECORDED THEREON AND RECORDING AND REPRODUCING METHODS AND APPARATUSES

1. TECHNICAL FIELD

The present invention relates to a recording medium having a data structure for managing reproduction of at least still images recorded thereon as well as methods and apparatuses for reproduction and recording.

2. BACKGROUND ART

The standardization of new high-density read only and rewritable optical disks capable of recording large amounts of high-quality video and audio data has been progressing rapidly and new optical disk related products are expected to be commercially available on the market in the near future. The Blu-ray Disc Rewritable (BD-RE) and Blu-ray Disk ROM (BD-ROM) are examples of these new optical disks.

The standardization for high-density read-only optical disks such as the Blu-ray ROM (BD-ROM) is still under way. An effective data structure for managing reproduction of still images recorded on the high-density read-only optical disk such as a BD-ROM is not yet available.

3. DISCLOSURE OF INVENTION

The recording medium according to the present invention includes a data structure for managing reproduction of still images recorded on the recording medium.

In one exemplary embodiment, a navigation area of the

recording medium includes a plurality of marks. At least a portion of the marks are associated with still images, and each mark associated with a still image serves as a pointer to the still image to provide for skipping between still images during reproduction. For example, a data area of the recording medium may store at least first and second still images, and a playlist area of the recording medium may store at least one playlist. The playlist includes mark information, and the mark information provides a first mark providing presentation information on the first image and a second mark providing presentation information on the second image.

The present invention further provides apparatuses and methods for recording and reproducing the data structure according to the present invention, and recording and reproducing slideshows according to the present invention.

4. BRIEF DESCRIPTION OF DRAWINGS

The above features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

Fig. 1 illustrates an exemplary embodiment of a recording medium file or data structure according to the present invention;

Fig. 2 illustrates an example of a recording medium having the data structure of Fig. 1 stored thereon;

Fig. 3 illustrates a method of managing still images for a high-density optical disk in accordance with one embodiment of the invention;

Fig. 4 illustrates a method of managing still images for a high-density optical disk in accordance with another exemplary embodiment of the invention;

Fig. 5A illustrates one exemplary method of managing still images in accordance with an exemplary embodiment of the invention;

Fig. 5B illustrates one exemplary method of managing still images and video presentation units (VPUs) in accordance with an exemplary embodiment of the invention;

Fig. 6 illustrates one exemplary embodiment of the navigation information for still images provided by associated playlist marks;

Figs. 7A-7C illustrate other exemplary embodiments of the navigation information for still images and/or VPUs provided by associated playlist marks;

Fig. 8A illustrates another exemplary embodiment of a method of managing still images according to the present invention;

Fig. 8B illustrates another exemplary embodiment of a method of managing still images and VPUs according to the present invention;

Fig. 9A illustrates an exemplary embodiment of the navigation information for still images provided by a still indicator information field;

Fig. 9B illustrates an exemplary embodiment of the navigation information for still images and VPUs provided by a slideshow indicator information field;

Fig. 10 illustrates another exemplary embodiment of a method for managing still images according to the present invention;

Figs. 11A and 11B each illustrate an exemplary embodiment of the playitem information field according to the present invention;

Fig. 12A illustrates another exemplary embodiment of a method for managing still images according to the present invention;

Fig. 12B illustrates another exemplary embodiment of a method for managing still images and VPUs according to the present invention;

Figs. 13A and 13B each illustrate an exemplary embodiment of the sub-playitem information field according to the present

invention;

Fig. 14A illustrates a method of recording still information packets for identifying still display positions in accordance with an exemplary embodiment the invention;

Fig. 14B illustrates a method of recording slideshow information packets for identifying display positions in accordance with an exemplary embodiment the invention; and

Fig. 15 illustrates a method of recording still information packets for identifying still display positions in accordance with another exemplary embodiment the invention;

Fig. 16 illustrates a schematic diagram of an embodiment of an optical disk recording and reproduction apparatus of the present invention;

Figs. 17-19 illustrate examples of synchronized or time-based slideshows; and

Fig. 20 illustrates an example of a browsable slideshow.

5. MODES FOR CARRYING OUT THE INVENTION

In order that the invention may be fully understood, exemplary embodiments thereof will now be described with reference to the accompanying drawings.

A high-density optical disk, for example, a Blu-Ray ROM (BD-ROM), BD-RE, etc. in accordance with the invention may have a file or data structure for managing reproduction of video and audio data as shown in Fig. 1. Some aspects of the data structure according to the present invention shown in Fig. 1 are the same as the well-known BD-RE standard, as such these aspects will not be described in great detail.

As shown in Fig. 1, the root directory contains at least one BD directory. The BD directory includes general files (not shown), a PLAYLIST directory in which playlist files (e.g., *.mpls) are stored, a CLIPINF directory in which clip information files (*.clpi) are stored, and a STREAM directory in which

MPEG2-formatted A/V stream clip files (*.m2ts), corresponding to the clip information files, are stored.

The STREAM directory includes MPEG2-formatted A/V stream files called clips or clip files. The A/V stream includes source packets of video and audio data. For example, a source packet of video data includes a header and a transport packet. A source packet includes a source packet number, which is generally a sequentially assigned number that serves as an address for accessing the source packet. Transport packets include a packet identifier (PID). The PID identifies the sequence of transport packets to which a transport packet belongs. Each transport packet in the sequence will have the same PID.

The CLIPINF directory includes a clip information file associated with each A/V stream file. The clip information file indicates, among other things, the type of A/V stream associated therewith, sequence information, program information and timing information. The sequence information describes the arrival time basis (ATC) and system time basis (STC) sequences. For example, the sequence information indicates, among other things, the number of sequences, the beginning and ending time information for each sequence, the address of the first source packet in each sequence and the PID of the transport packets in each sequence. A sequence of source packets in which the contents of a program is constant is called a program sequence. The program information indicates, among other things, the number of program sequences, the starting address for each program sequence, and the PID(s) of transport packets in a program sequence.

The timing information is referred to as characteristic point information (CPI). One form of CPI is the entry point (EP) map. The EP map maps a presentation time stamp (e.g., on an arrival time basis (ATC) and/or a system time basis (STC)) to a source packet address (i.e., source packet number). The presentation time stamp (PTS) and the source packet number (SPN) are related to an entry

point in the AV stream; namely, the PTS and its related SPN point to an entry point on the AV stream. The packet pointed to is often referred to as the entry point packet.

The PLAYLIST directory includes one or more playlist files. The concept of a playlist has been introduced to promote ease of editing/assembling clips for playback. A playlist file is a collection of playing intervals in the clips. Each playing interval is referred to as a playitem. The playlist file, among other things, identifies each playitem forming the playlist, and each playitem, among other things, is a pair of IN-point and OUT-point that point to positions on a time axis of the clip (e.g., presentation time stamps on an ATC or STC basis). Expressed another way, the playlist file identifies playitems, each playitem points to a clip or portion thereof and identifies the clip information file associated with the clip. The clip information file is used, among other things, to map the playitems to the clip of source packets.

The general information files (not shown) provide general information for managing the reproduction of the A/V streams recorded on the optical disk.

In addition to illustrating the data structure of the recording medium according to an embodiment of the present invention, Fig. 1 represents the areas of the recording medium. For example, the general information files are recorded in one or more general information areas, the playlist directory is recorded in one or more playlist directory areas, each playlist in a playlist directory is recorded in one or more playlist areas of the recording medium, etc. Fig. 2 illustrates an example of a recording medium having the data structure of Fig. 1 stored thereon. As shown, the recording medium includes a file system information area, a data base area and an A/V stream area. The data base area includes a general information file and playlist information area and a clip information area. The general information file and playlist information area have the general information files recorded in

a general information file area thereof, and the PLAYLIST directory and playlist files recorded in a playlist information area thereof. The clip information area has the CLIPINFO directory and associated clip information files recorded therein. The A/V stream area has the A/V streams for the various titles recorded therein.

Video and audio data are typically organized as individual titles; for example, different movies represented by the video and audio data are organized as different titles. Furthermore, a title may be organized into individual chapters in much the same way a book is often organized into chapters.

Because of the large storage capacity of the newer, high-density recording media such as BD-ROM and BD-RE optical disks, different titles, various versions of a title or portions of a title may be recorded, and therefore, reproduced from the recording media. For example, video data representing different camera angles may be recorded on the recording medium. As another example, versions of title or portions thereof associated with different languages may be recorded on the recording medium. As a still further example, a director's version and a theatrical version of a title may be recorded on the recording medium. Or, an adult version, young adult version and young child version (i.e., different parental control versions) of a title or portions of a title may be recorded on the recording medium. Each version, camera angle, etc. represents a different reproduction path, and the video data in these instances is referred to as multiple reproduction path video data.

Because of the large storage capacity of the newer, high-density recording media such as BD-ROM still images may be recorded and reproduced in an organized and/or user interactive fashion, for example, as slideshows. The data structure for managing reproduction of still images for a high-density optical disk in accordance with embodiments of the present invention will be described along with methods and apparatuses according to embodiments of the present invention for recording and

reproducing still images.

Fig. 3 illustrates a method of managing still images for a high-density optical disk in accordance with one embodiment of the invention. In this embodiment, a plurality of still images are recorded as a still image file on a BD-ROM and the plurality of still images stored in the still image file are linked to specific navigation information of a playlist including navigation information for playback control of still images. The specific navigation information linked to the still images is linked to specific movie video data contained in a clip A/V stream storing movie video and audio data.

As depicted in Fig. 3, a plurality of still images can be linked to one recording position. The plurality of still images can be displayed in various ways, for example, by a sequential, a random/shuffle, or an automatic/manual slideshow. The various display options will be described in greater detail below.

Fig. 4 illustrates a method of managing still images for a high-density optical disk in accordance with another exemplary embodiment of the invention. This embodiment is the same as the embodiment of Fig. 3 except the clip A/V stream only contains audio data. In this case, while playing the audio data, the optical disk reproducing apparatus detects still images linked to specific recording positions of the audio data and performs a still operation that outputs the detected still images together with the audio data.

According to the embodiments of the present invention, movie data (e.g., video or video and audio) and still images or audio data and still images may be provided to a user through, for example, a television set connected to an optical disk reproducing apparatus such as discussed in detail below. Methods of managing navigation information for linking still images to the movie or audio data will now be described in detail.

Fig. 5A illustrates one exemplary method of managing still

images in accordance with an exemplary embodiment of the invention. In this embodiment, one or more playlist marks are defined for managing still images. As shown in Fig. 5A, a still image or a group of still images is linked to a playlist by a playlist mark, referred to as a still mark. In this manner, the still images may be managed as a slideshow as described in more detail below. The playlist marks are described in greater detail below with respect to Figs. 6-7.

Fig. 6 illustrates one exemplary embodiment of the navigation information for still images provided by associated playlist marks. A playlist file includes a playlist mark information field called 'PlayList Mark'. As shown in Fig. 6, the playlist mark 'PlayListsMark' information field indicates a length of the information field and a number of the playlist marks 'number_of_PlayList_marks' in the playlist. In case of the BD-RE, the 'length' field has a value of '26 bytes'. In case of the BD-ROM in accordance with the invention the length field may have a value greater than 26 bytes. For each playlist mark, the playlist mark 'PlayListsMark' information field indicates the mark type 'mark_type', a time stamp 'mark_time_stamp', duration 'duration', maker's information 'makers_information', and maker's name 'maker_name'.

The mark type indicates the type of mark. For example, when a mark indicates the beginning of a chapter, the mark type 'mark_type' identifies the associated mark as a chapter mark. As further shown in Fig. 6, if a mark is of the still type, then an index number of the associated still image or images recorded on the BD-ROM 'ref_to_still_image_index' is provided.

The time stamp 'mark_time_stamp' of the mark indicates a point where the mark is placed; namely, indicates a point on a time axis of the A/V stream of clips (e.g., ATC and/or STC basis) where the mark is placed. The 'duration' indicates the length of the mark that starts from the time stamp indicated by the 'mark_time_stamp'.

If the mark is a still mark, then the duration 'duration' may indicate a length of time to display the still image.

The maker's information 'maker_information' provides information supplied by the maker, and the maker's name 'maker_name' gives the maker's name.

As demonstrated from the description of Fig. 6, when a mark is a still mark, the information associated with the still mark provides navigation information for reproducing the still image associated with the still mark.

Fig. 7A illustrates another exemplary embodiment of the navigation information for still images provided by associated playlist marks. As shown, this embodiment is the same as the embodiment of Fig. 6 except that if the mark is a still mark (e.g., mark type =0x10) then additional information regarding the reproduction of the still image or images is provided in association with the still mark. Specifically, the following indicator fields are provided: an indicator of the number of still images associated with the still mark 'number_of_still_images', an indicator of the display timing 'display_timing_mode', an indicator of the display order 'display _order_mode', an indicator of the display effect 'display_effect_mode' and an indicator of the period for the display effect 'display_effect_period'.

If the 'display_timing_mode' field is '0', it indicates an automatic slide show. If the 'display_timing_mode' field is '1', it indicates a browsable still or slideshow operation, which displays still images based on key input by a user. If the 'display_order_mode' field is '0', it indicates a sequential still operation in which the still images are to be displayed sequentially. If the 'display_order_mode' field is '1', it indicates a random still operation in which the still images are to be displayed in a random manner.

The 'display_effect_mode' indicates the effect to be applied to the still image such as cut-in/cut-out or

fade-in/fade-out. The 'display_effect_period' field indicates the time duration for which the corresponding display effect is valid. The fields of 'display_timing_mode', 'display_order_mode', 'display_effect_mode' and 'display_effect_period' can be defined and managed for each still image.

In the case where a plurality of still images are linked, the 'ref_to_still_index' field indicative of the index number of a still image is defined as the index number of the last still image or the number of linked still images. If only one still image is linked, the 'ref_to_still_index' is defined to be '0xFFFF'.

As a further alternative, the embodiment of Fig. 7A may provided without including the 'ref_to_still_index' field.

Fig. 5B illustrates a method of managing still images in accordance with an exemplary embodiment of the invention that is the same as Fig. 5A, except that playlist marks may also be defined as movie marks. Movie marks are used for management of video presentation units (VPUs). A prescribed recording block of a clip of an A/V stream wherein both video and audio data are recorded or only video data are recorded is assigned as a video presentation unit (VPU). A VPU can be recorded and managed as a separate file. Navigation information may be recorded and managed so as to display a still image or video of a VPU at a particular position where display of a slideshow is desired, for example, such as in the middle of displaying motion video.

Fig. 7B illustrates an exemplary embodiment of the navigation information for still images and VPUs provided by associated playlist marks. This embodiment is the same as Fig. 7A, except that if the mark is a movie mark (e.g., mark type =0x11) then additional information regarding the reproduction of a VPU is provided in association with the movie mark. Specifically, the following indicator fields are provided: 'VPU_Clip_file_name' to provide the clip file name of the VPU, the 'VPU_start_TM' and

'VPU_end_TM' information to select and play the specified recording block of the VPU, 'VPU_data_size' information to indicate of the data record size of the VPU, and 'VPU_info' to provide information about the attributes of video data recorded in the VPU.

Fig. 7C illustrates another example embodiment of the playlist mark information field. As shown, this embodiment is the same as the embodiment of Fig. 7B except the navigation information for still images is not included.

Fig. 8A illustrates another exemplary embodiment of a method of managing still images according to the present invention. In this embodiment, navigation information such as the display time and display method of a still image or a group of still images are provided by one or more still indicators. As shown, a still indicator links one or a group of still images with a clip AV stream. The clip A/V stream may contain movie video and audio data together or only audio data. The still images may be stored in a single image file or each still image may be stored in an individual image file.

As illustrated in Fig. 9A, the still indicator 'PlayListStillIndicator' is a new information field added to a playlist file 'PlayList_File'. This new information field indicates a length of the information field and a number of the playlist stills 'number_of_PlayList_stills'. For each playlist still, the playlist indicator 'PlayListStillIndicator' information field indicates a time stamp 'still_time_stamp', a start index number of the associated still image(s) recorded on the BD-ROM 'ref_to_still_start_index', and a number of still images 'number_of_still_images.'

The time stamp 'still_time_stamp' of the playlist still indicates a point where the playlist still is placed; namely, indicates a point on a time axis of the A/V stream of clips (e.g., ATC and/or STC basis) where the playlist still is placed.

Furthermore, as shown in Fig. 9A, for each still image associated with a playlist still, the following information is provided: a duration 'duration' to display the still image, an indicator of the display timing 'display_timing_mode', an indicator of the display order 'display _order_mode', an indicator of the display effect 'display_effect_mode' and an indicator of the period for the display effect 'display_effect_period'. These indicators were defined above with respect to Fig. 7A.

Fig. 8B illustrates another exemplary embodiment of a method of managing still images and VPUs according to the present invention. In this embodiment, navigation information such as the display time and display method of a still image or a group of still images and/or VPUs are provided by one or more slideshow indicators. As shown, a slideshow indicator links one or a group of still images with a clip AV stream, or links a VPU with a clip AV stream. The clip A/V stream may contain movie video and audio data together or only audio data. The still images may be stored in a single image file or each still image may be stored in an individual image file.

As illustrated in Fig. 9B, the slideshow indicator 'PlayListSlideshowIndicator' is a new information field added to a playlist file 'PlayList_File'. This new information field indicates a length of the information field and a number of slideshow object 'number_of_slideshow_objects'. For each slideshow object, the slideshow indicator indicates a time stamp 'still_time_stamp'. The time stamp 'still_time_stamp' indicates a point where the slideshow object is placed; namely, indicates a point on a time axis of the A/V stream of clips (e.g., ATC and/or STC basis) where the slideshow object is placed.

If the slideshow object is a still image, a start index number of the associated still image(s) recorded on the BD-ROM 'ref_to_still_start_index', and a number of still images 'number_of_still_images' are provided. Furthermore, as shown in

Fig. 9B, for each still image associated with a playlist still, the following information is provided: a duration 'duration' to display the still image, an indicator of the display timing 'display_timing_mode', an indicator of the display order 'display_order_mode', an indicator of the display effect 'display_effect_mode' and an indicator of the period for the display effect 'display_effect_period'. These indicators were defined above with respect to Fig. 7A.

If the slideshow object is a VPU, then the 'VPU_Clip_file_name' information to identify the clip file of said VPU, 'VPU_start_TM' and 'VPU_end_TM' information to select and play the specified recording block of the VPU, 'VPU_data_size' information about data record size of the VPU, and 'VPU_info' information about the attributes of video data recorded in the VPU are included and recorded.

Fig. 10 illustrates another exemplary embodiment of a method for managing still images according to the present invention. In this embodiment, playitems are used to manage one or more still images. For example, as shown, some playitems manage movie video and audio data or only audio data and some playitems manage a still image, a group of still images or slideshow (or portion of a slideshow), and have been labeled still playitems.

The clip A/V stream corresponding to the playlist may contain movie video and audio data together or only audio data. The still images may be stored in a single image file or each still image may be stored in an individual image file. The playitems of the playlist provide navigation information linking the still images and the clip A/V stream. As will be appreciated, the still images and, for example, the audio data are recorded in separate files and managed by separate files. In this manner, the still images and audio data may be reproduced together but independently. This permits, for example, continuously loop through (i.e., repeating) the clip of audio data linked with still images forming

a slideshow while the still images are presented.

Fig. 11A illustrates an exemplary embodiment of the playitem information field according to the present invention. The playitem 'PlayItem' information field indicates a length of the information field, and indicates the name of the clip information file 'Clip_Information_File_Name' associated with the playitem.

The playitem information field also includes an indicator 'Clip_codec-identifier' indicating whether the playitem is a still playitem and associated with one or more still images. For example, the 'Clip_codec_identifier' field may indicate the encoding format of a still image such as 'JPEG', which then serves to indicate that the playitem is a still playitem for still image display.

If the CPI type given in the clip information file associated with the playitem is an EP map type signified by CPI type = 1, then the playitem includes an STC reference 'ref_to_STC-id' on the clip indicated by the clip information file name 'Clip-Information_file_name'.

The playitem also includes IN_time and OUT_time fields. The 'IN_time' field takes up 2 bytes and indicates the index number of the first still image among the linked still images stored in the still image file and the 'OUT-time' field indicates the index number of the last still image among the linked still images.

Furthermore, as shown in Fig. 11A, if the playitem is a still playitem, then the number of still images 'number_of_still_images' is provided; and for each still image, the following information is provided: a duration 'duration to display the still image, an indicator of the display timing 'display_timing_mode', an indicator of the display order 'display _order_mode', an indicator of the display effect 'display_effect_mode' and an indicator of the period for the display effect 'display_effect_period'. These indicators were defined above with respect to Fig. 7A.

As will be appreciated, even though not shown in Fig. 10, a

playitem may also serve as a VPU playitem. Fig. 11B illustrates an exemplary embodiment of a VPU playitem. Here, the clip codec identifier identifies the playitem as a VPU playitem, and provides the same VPU information discussed above with respect to movie marks and VPU slideshow objects.

Fig. 12A illustrates another exemplary embodiment of a method for managing still images according to the present invention. In this embodiment, sub-playitems are used to manage one or more still images, while movie data (e.g., audio and video data) or only audio data is managed using playitems. The sub-playitem indicates a sub-path in a playlist.

In this method, a still image or a group of still images stored in a still image file is linked to a sub-playitem included in a playlist. The clip A/V stream corresponding to the playlist may contain movie video and audio data together or only audio data. The still images may be stored in a single image file or each still image may be stored in an individual image file. As will be appreciated, the still images and, for example, the audio data are recorded in separate files and managed by separate files. In this manner, the still images and audio data may be reproduced together but independently. This permits, for example, continuously loop through (i.e., repeating) the clip of audio data linked with still images forming a slideshow while the still images are presented.

Fig. 13A illustrates an exemplary embodiment of the sub-playitem information field according to the present invention. The sub-playitem 'SubPlayItem' information field indicates a length of the information field, and indicates the name of the clip information file 'Clip_Information_File_Name' associated with the sub-playitem.

The sub-playitem information field also includes an indicator 'Clip_codec-identifier' and a type indicator 'SubPlayItem_type' both indicating whether the playitem is a still

playitem and associated with one or more still images. For example, the 'Clip_codec_identifier' field may indicate the encoding format of a still image such as 'JPEG', which then serves to indicate that the playitem is a still playitem for still image display. With respect to the type indicator 'SubPlayItem_type', if the type indicator 'SubPlayItem_type' equals, for example, "2", then this indicates the sub-playitem is associated with a sub-path for displaying one or more associated still images.

The sub-playitem also includes IN_time and OUT_time fields. The 'IN_time' field takes up 2 bytes and indicates the index number of the first still image among the linked still images stored in the still image file and the 'OUT-time' field indicates the index number of the last still image among the linked still images.

The sub-playitem further includes an STC reference 'ref_to_STC_id' for the clip indicated by the clip information file name 'Clip-Information_file_name', an id of the playitem containing this sub-playitem 'sync_Playitem_id', and an indication 'Sync_start_PTS_of_PlayItem' of a presentation-time in the playitem indicated by the 'sync_Playitem_id.'

Furthermore, as shown in Fig. 13A, if the playitem is a still playitem, then the number of still images 'number_of_still_images' is provided; and for each still image, the following information is provided: a duration 'duration' to display the still image, an indicator of the display timing 'display_timing_mode', an indicator of the display order 'display _order_mode', an indicator of the display effect 'display_effect_mode' and an indicator of the period for the display effect 'display_effect_period'. These indicators were defined above with respect to Fig. 7A.

In an alternative embodiment, the movie video and audio data or only audio is managed by a sub-playitem and the still image, images or slideshow (or portion thereof) is managed by a playitem.

Fig. 12B illustrates an exemplary embodiment of the present invention that is the same as the embodiment of Fig. 12A, except

that a sub-playitem may also serve as a VPU sub-playitem to manage reproduction of a VPU.

Fig 13B illustrates an exemplary embodiment of a sub-playitem according to the embodiment of Fig. 12B. As shown the sub-playitem embodiment of Fig. 13B is the same as the embodiment of Fig. 12B, except that if the clip codec identifier and/or sub-playitem type indicator indicate the sub-playitem is a VPU sub-playitem, then the sub-playitem further indicates the size of the VPU and information about the attributes of video data recorded in the VPU. For example, with respect to the type indicator 'SubPlayItem_type', if the type indicator 'SubPlayItem_type' equals, for example, "3", then this indicates the sub-playitem is associated with a sub-path for displaying a VPU.

Next, embodiments of a method for recording still information packets for allowing detection of still display positions will be described in detail. Fig. 14A illustrates a method of recording still information packets for identifying still image display positions in accordance with one embodiment the present invention. In this method, source packets recorded at still display start and still display end positions contained in the clip A/V stream, which is pointed to by at least one type of navigation information among still marks, still indicators, still playitems, and sub-playitems, are defined as still information packets for identifying groups of still images.

A still information packet comprises a 4-byte TP (transport packet) extra header and a 188-byte MPEG2 TP (transport packet). The MPEG2 TP further comprises a packet header and a payload. As depicted in Fig. 14A, the still information including fields of 'still_start_end_flag', 'number_of_images', and 'display_info' recorded in the payload.

For example, if the 'still_start_end_flag' field is '0', it indicates the still display start position. If this field is '1', it indicates the still display end position. The

'number_of_images' field is only meaningful at the display start position and 'display_info' field stores the display order, the display effect, and the display effect period, etc.

If the decoding operation in a VDP system such as shown in Fig. 16 detects a source packet having still information, that is, a still information packet while playing movie video and/or audio data recorded in the clip A/V stream, the optical disk reproducing apparatus displays the still image after stopping playing of the movie video data or displays the still image with playing audio data.

Referring to the 'still_start_end_flag', the VDP system starts or stops display of the still image. Two different types of packets, a still start packet and a still end packet, may be recorded at the still display start and end positions, respectively.

Fig. 14B illustrates a method of recording slideshow information packets for identifying slideshow display positions in accordance with one embodiment the present invention. In this method, source packets recorded at slideshow display start and slideshow display end positions contained in the clip A/V stream, which is pointed to by at least one type of navigation information among playlist marks, still indicators, slideshow indicators, playitems, and sub-playitems, are defined as slideshow information packets for identifying groups of still images.

A slideshow information packet comprises a 4-byte TP (transport packet) extra header and a 188-byte MPEG2 TP (transport packet). The MPEG2 TP further comprises a packet header and a payload. As depicted in Fig. 14B, the slideshow information include the field of 'slideshow_start_end_flag', the fields of 'number_of_images', and 'display_info' if the slideshow information packet is a still image information packet, and the fields of duration of the VPU and data size of the VPU if the slideshow information packet is a VPU information packet.

If the decoding operation in a VDP system such as shown in Fig. 16 detects a source packet having slideshow information, that is, a slideshow information packet while playing movie video and/or audio data recorded in the clip A/V stream, the optical disk reproducing apparatus displays the still image or VPU after stopping playing of the movie video data or displays the still image with playing audio data.

Referring to the 'still_start_end_flag', the VDP system starts or stops display of the still image. Two different types of packets, a still start packet and a still end packet, may be recorded at the still display start and end positions, respectively.

Fig. 15 illustrates a method of recording still information packets for identifying still image display positions in accordance with another embodiment of the invention. In this method, still information packets are added to display positions of all the still images contained in the clip A/V stream, which is pointed to by the navigation information employing at least one type among still marks, still indicators, still playitems, or sub-playitems. In this embodiment, still images can be detected by the still information packets.

As described above, the still information packet contains still information including the fields of 'still_start_end_flag' and 'display_info'. The 'display_info' field includes the display order, the display effect, and the display effect period, etc.

If the decoding operation in a VDP system such as shown in Fig. 16 detects a source packet having the still information, that is, a still information packet while playing movie video and/or audio data recorded in the clip A/V stream, the optical disk reproducing apparatus displays the still image after stopping playing of the movie video data or displays the still image with playing audio data.

The still information packet may be added to both the still

image start and end positions. Referring to the 'still_start_end_flag', the VDP system starts or stops display of the still image. Two different types of packets, a still start packet and a still end packet, may be recorded at the still display start and end positions, respectively.

An optical disk reproducing apparatus outputs movie data and still images or audio data and still images to, for example, a connected television set by referring to navigation information according to the present invention such as still marks, still indicators, slideshow indicators, still playitems, and sub-playitems. Fig. 16 illustrates a schematic diagram of an embodiment of an optical disk recording and reproducing apparatus according to the present invention. As shown, an AV encoder 9 receives and encodes data (e.g., movie video and audio data, only audio data, and/or still image data). The AV encoder 9 outputs the encoded data along with coding information and stream attribute information. A multiplexer 8 multiplexes the encoded data based on the coding information and stream attribute information to create, for example, an MPEG-2 transport stream. A source packetizer 7 packetizes the transport packets from the multiplexer 8 into source packets in accordance with the audio/video format of the optical disk. As shown in Fig. 14, the operations of the AV encoder 9, the multiplexer 8 and the source packetizer 7 are controlled by a controller 10. The controller 10 receives user input on the recording operation, and provides control information to AV encoder 9, multiplexer 8 and the source packetizer 7. For example, the controller 10 instructs the AV encoder 9 on the type of encoding to perform, instructs the multiplexer 8 on the transport stream to create, and instructs the source packetizer 7 on the source packet format. The controller 10 further controls a drive 3 to record the output from the source packetizer 7 on the optical disk.

The controller 10 also creates the navigation and management

information for managing reproduction of the data being recorded on the optical disk. For example, based on information received via the user interface (e.g., instruction set saved on disk, provided over an intranet or internet by a computer system, etc.) the controller 10 controls the drive 3 to record one or more of the data structures of Figs. 1-15 on the optical disk.

During reproduction, the controller 10 controls the drive 3 to reproduce this data structure. Based on the information contained therein, as well as user input received over the user interface (e.g., control buttons on the recording and reproducing apparatus or a remote associated with the apparatus), the controller 10 controls the drive 3 to reproduce the data from the optical disk. For example, as discussed above with respect to the embodiments of the present invention, a still image or still images may be reproduced in association with movie video and audio data or only audio data based on the navigation information. Furthermore, an image or group of images may be reproduced as a slideshow or portion of a slideshow. As also discussed, a slideshow may be synchronized, browsable, etc.

The reproduced source packets are received by a source depacketizer 4 and converted into a data stream (e.g., an MPEG-2 transport packet stream). A demultiplexer 5 demultiplexes the data stream into encoded data. An AV decoder 6 decodes the encoded data to produce the original data that was feed to the AV encoder 9. During reproduction, the controller 10 controls the operation of the source depacketizer 4, demultiplexer 5 and AV decoder 6. The controller 10 receives user input on the reproducing operation, and provides control information to AV decoder 6, demultiplexer 5 and the source packetizer 4. For example, the controller 10 instructs the AV decoder 9 on the type of decoding to perform, instructs the demultiplexer 5 on the transport stream to demultiplex, and instructs the source depacketizer 4 on the source packet format.

While Fig. 16 has been described as a recording and reproducing apparatus, it will be understood that only a recording or only a reproducing apparatus may be provided using those portions of Fig. 16 providing the recording or reproducing function.

Next, some of the different types of slideshows will be described in detail with reference to Figs. 17-20. It will be appreciated that these are merely examples, and the data structure of the present invention provides for other types of slideshows.

Figs. 17-19 illustrate examples of synchronized or time-based slideshows. In this example, the display items (VPUs and/or still items) are displayed at a particular point in time. In the examples of Figs. 17-19, the display items are displayed at particular points in time in synchronization with the audio data reproduced from a clip A/V stream. The presentation time and duration of each display item are provided by the navigation information in a playlist. For example, the navigation information includes one or more of a playlist mark, still or slideshow indicator, playitem and sub-playitem as described in detail above. The navigation information for the audio data is supplied by one of a playitem and sub-playitem in the playlist. The navigation information may further indicate whether a sequential or random playback should occur.

Fig. 17 illustrates an example of sequential synchronized playback: Here, the seven display items Display #1-#7, which include VPUs #1 and #2 and still items #1-#5, are displayed at the presentation times indicated with respect to each display item.

Fig. 18 illustrates an example of random playback of the seven display items Display #1-#7. Here, the VDP system obtains the presentation time for each display item from the navigation information, but randomly picks which display item to display at each obtained presentation time. Fig. 19 illustrates an example

where a first portion of playback is sequential and a second portion of playback is random.

Fig. 20 illustrates an example of a browsable slideshow. In a browsable slideshow, each display item is displayed until user input is received that indicates to change from the displayed display item. With a browsable slideshow, the navigation information indicates the duration of, for example, a still image as infinite. The user input received may indicate to proceed to a next display item or a previous display item. When a browsable slideshow is reproduced with audio data as shown in Fig. 20, no synchronization exists between the audio data and the display items. Instead, the audio data is continuously and repeatedly reproduced during the slideshow. As further shown with respect to VPU #1, if a VPU is reproduced as a display item, and reproduction of the VPU completes before user input to change the display item is received, then the last picture of the VPU is maintained as a still image. As with time-based slideshows, the display of display items may be sequential or random. Fig. 20 illustrates a sequential browsable slideshow.

Next, a more detail description of reproducing a browsable slideshow based on the navigation information will be described. As discussed, a browsable slideshow may be reproduced based on playlist marks defined as still marks. In this example, the controller 10 reproduces a playlist, and based on the navigation information in the playlist, the controller 10 reproduces a still image along with, for example, only audio data. The playlist provides navigation information, for example, a playitem or sub-playitem, for the audio data and provides a still mark linking the still image with the audio data. The controller 10 causes output of the still image until user input instructing the controller 10 to skip to the next or previous still image is received. The controller 10 then reproduces the next or previous still image. This next or previous image may be the next or previous image in

a group of images referred to by the still mark, or may be the still image referred to by the next or previous still mark in the playlist. This same browsable slideshow operation may be performed based on still indicators.

A browsable slideshow may also be reproduced based on the playitems or sub-playitems defined as still playitems or sub-playitems. Here, the controller 10 reproduces, for example, only audio data referenced by a non-still playitem or sub-playitem in the playlist, and reproduces a still image or one still image in a group of still images referenced by a still playitem or sub-playitem in the playlist. The controller 10 causes output of the still image until user input instructing the controller 10 to skip to the next or previous still image is received. The controller 10 then reproduces the next or previous still image. This next or previous image may be the next or previous image in a group of images referred to by the current still playitem or still sub-playitem, or may be the still image referred to by the next or previous still playitem or still sub-playitem in the playlist.

As will be appreciated from the forgoing disclosure, the present invention provides a recording medium having a data structure for managing still images recorded on a high-density recording medium (e.g., a high-density optical disk such as a BD-ROM). For example, the data structure allows for displaying movie video and still images or audio and still images in various ways.

As apparent from the above description, the present invention provides methods and apparatuses for recording a data structure on a high density recording medium for managing still images recorded on the recording medium.

The above description further provides methods and apparatus for reproducing still images recorded on a high density recording medium based on a data structure, also recorded on the high density recording medium, for managing the reproduction of still images.

While the invention has been disclosed with respect to a limited number of embodiments, those skilled in the art, having the benefit of this disclosure, will appreciate numerous modifications and variations there from. For example, while described with respect to a Blu-ray ROM optical disk in several instances, the present invention is not limited to this standard of optical disk or to optical disks. It is intended that all such modifications and variations fall within the spirit and scope of the invention.

CLAIMS

1. A recording medium having a data structure for managing reproduction of still images recorded on the recording medium, comprising:

a data area storing at least first and second still images; and

a playlist area storing at least one playlist, the playlist including mark information, the mark information providing presentation information on the first and second images to provide for at least skipping from reproducing the first image to reproducing the second image.

2. The recording medium of claim 1, wherein the mark information includes a first mark associated with the first image and a second mark associated with the second image, the first and second marks providing the presentation information on the first and second images, respectively.

3. The recording medium of claim 2, wherein

the first mark includes a first indicator indicating at least a stream of data where the first mark is placed; and

the second mark includes a second indicator indicating at least a stream of data where the second mark is placed.

4. The recording medium of claim 2, wherein

the first mark includes a first indicator indicating a point in a stream of data where the first mark is placed; and

the second mark includes a second indicator indicating a point in a stream of data where the second mark is placed.

5. The recording medium of claim 2, wherein the first mark includes a type indicator indicating a type of the first mark, and the second mark includes a type indicator indicating a type of the second mark.

6. The recording medium of claim 2, wherein the mark

information indicates a number of marks in the mark information.

7. The recording medium of claim 2, wherein the first mark points to the first still image and the second mark points to the second still image.

8. A recording medium having a data structure for managing reproduction of still images recorded on the recording medium, comprising:

a navigation area including a plurality of marks, at least a portion of the marks associated with still images, each mark associated with a still image serving as a pointer to the still image to provide for skipping between still images during reproduction.

9. The recording medium of claim 8, wherein each mark associated with a still image includes an indicator indicating at least a stream of data where the mark is placed.

10. The recording medium of claim 8, wherein each mark associated with a still image includes an indicator indicating a point in a stream of data where the mark is placed.

11. The recording medium of claim 8, wherein each mark associated with a still image includes a type indicator indicating a type of the mark.

12. A method of reproducing a data structure for managing reproduction of still images recorded on the recording medium, comprising:

reproducing at least one playlist from the recording medium, the playlist including mark information, the mark information providing presentation information on first and second images to provide for at least skipping from reproducing the first image to reproducing the second image.

13. An apparatus for reproducing a data structure for managing reproduction of still images recorded on the recording medium, comprising:

a driver for driving an optical reproducing device to

reproduce data recorded on the recording medium;

a controller configured to control the driver to reproduce at least one playlist from the recording medium, the playlist including mark information, the mark information providing presentation information on first and second images to provide for at least skipping from reproducing the first image to reproducing the second image.

14. A method of recording a data structure for managing reproduction of at least still images recorded on a recording medium, comprising:

recording a plurality of marks in navigation area of the recording medium, at least a portion of the marks associated with still images, each mark associated with a still image serving as a pointer to the still image to provide for skipping between still images during reproduction.

15. An apparatus for recording a data structure for managing reproduction of at least multiple reproduction path video data on a recording medium, comprising:

a driver for driving an optical recording device to record data on the recording medium;

an encoder for encoding at least multiple reproduction path video data; and

a controller for controlling the driver to record a plurality of marks in navigation area of the recording medium, at least a portion of the marks associated with still images, each mark associated with a still image serving as a pointer to the still image to provide for skipping between still images during reproduction.

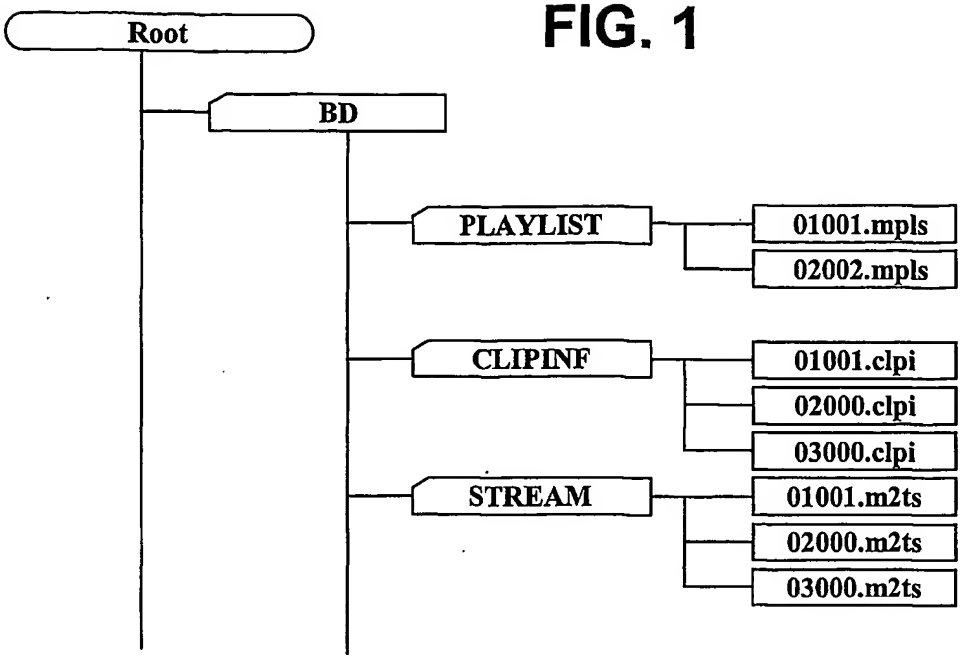

Root
BD
PLAYLIST
01001.mpls
02002.mpls
CLIPINF
01001.clpi
02000.clpi
03000.clpi
STREAM
01001.m2ts
02000.m2ts
03000.m2ts

FIG. 1

FIG. 2

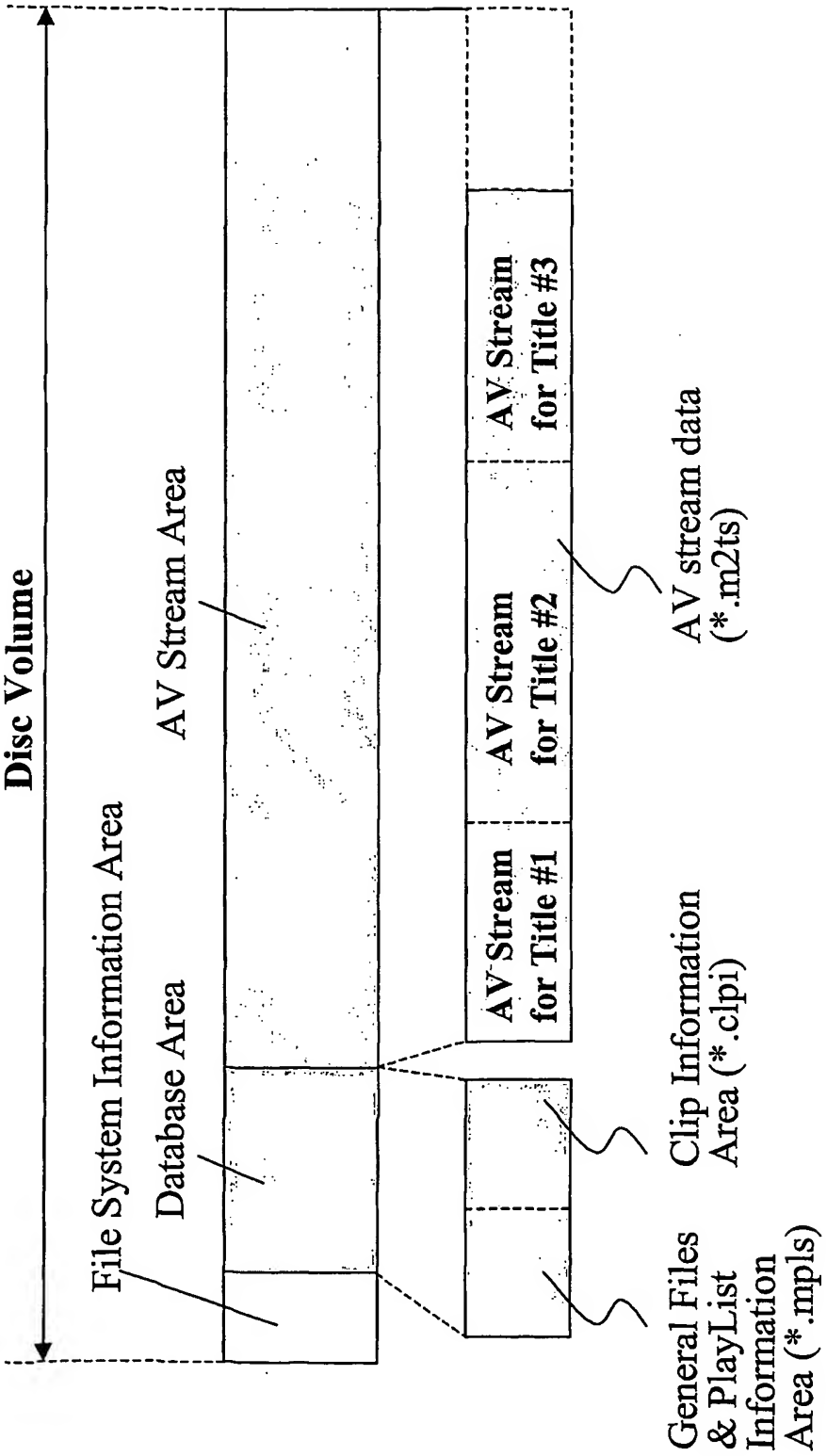

Disc Volume
File System Information Area
Database Area
AV Stream Area
AV Stream for Title #1
AV Stream for Title #2
AV Stream for Title #3
AV stream data (*.m2ts)
Clip Information Area (*.clpi)
General Files & PlayList Information Area (*.mpls)

FIG. 3

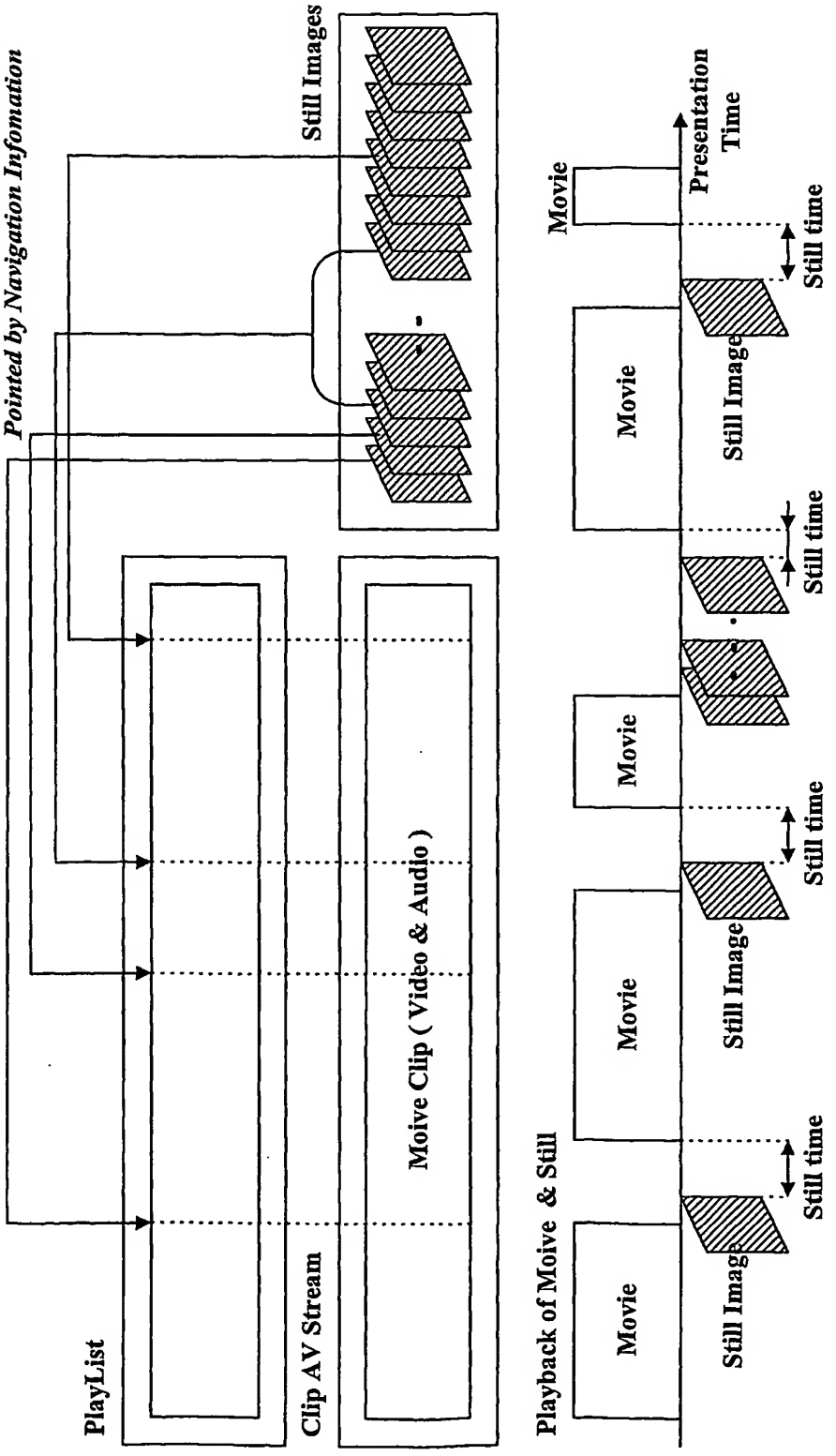

Pointed by Navigation Infomation
Still Images
PlayList
Clip AV Stream
Moive Clip (Video & Audio)
Playback of Moive & Still
Movie
Still Image
Still time
Presentation Time

FIG. 4

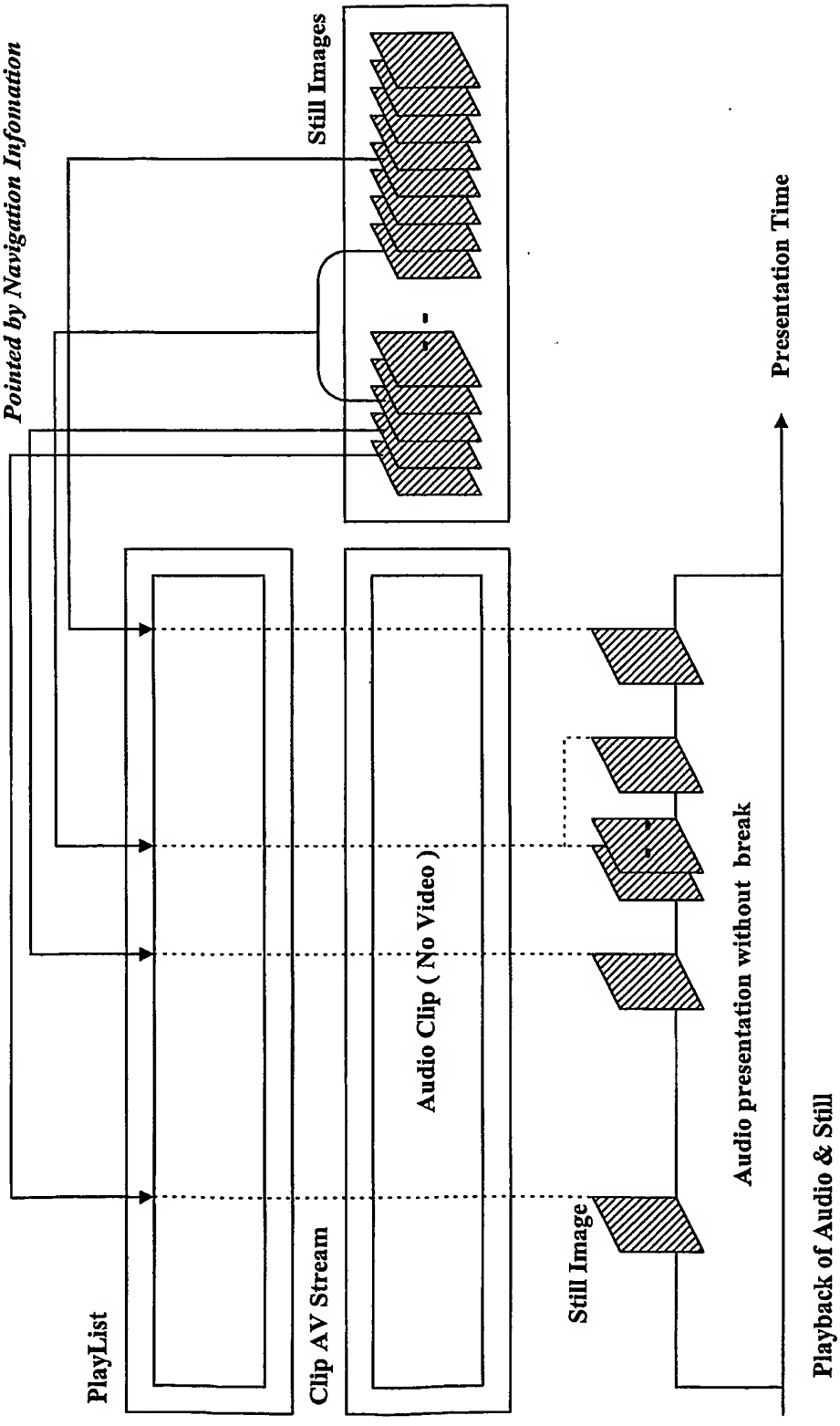

Pointed by Navigation Infomation
Still Images
PlayList
Clip AV Stream
Audio Clip (No Video)
Still Image
Audio presentation without break
Presentation Time
Playback of Audio & Still

FIG. 5A

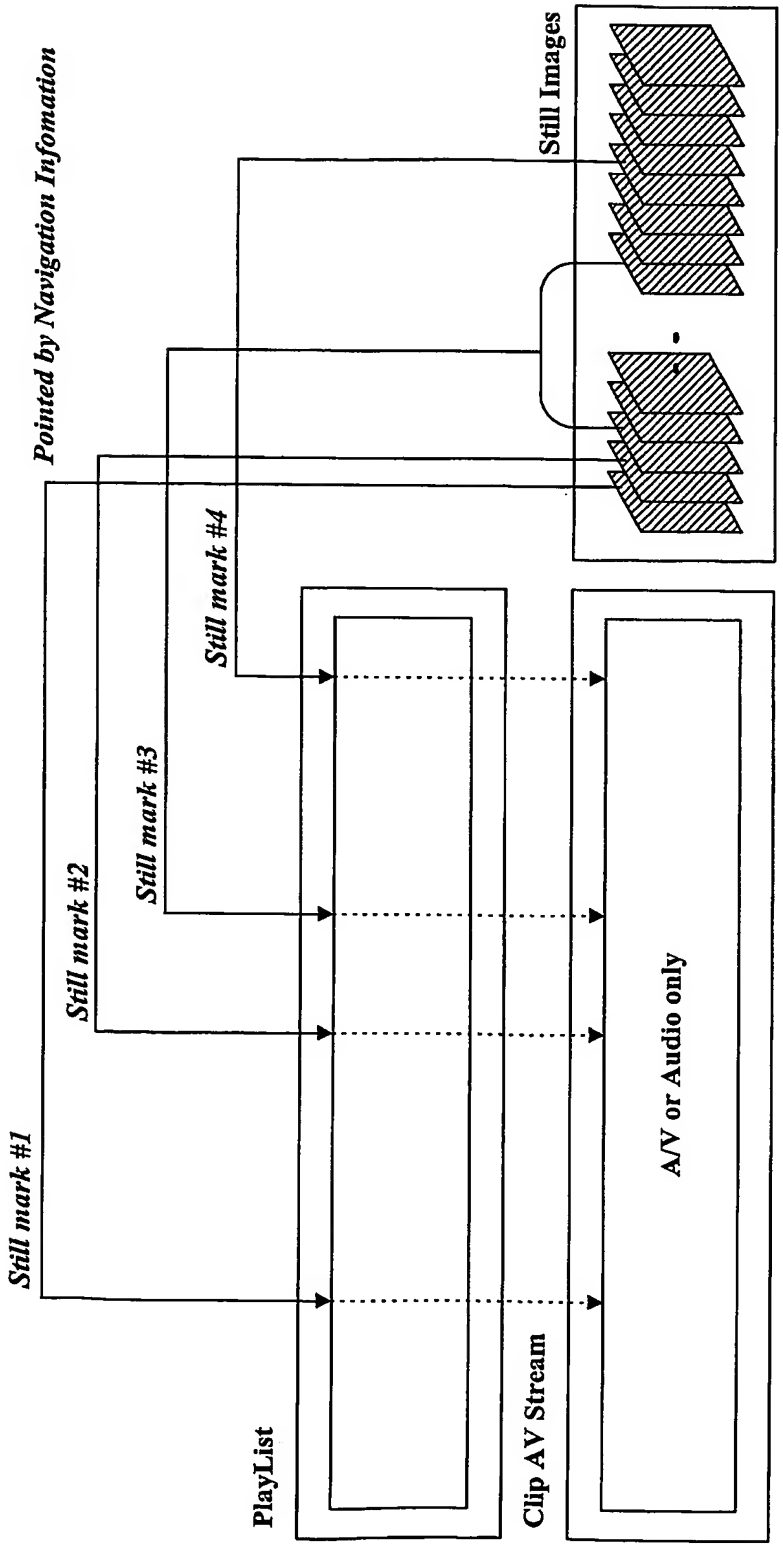

Still mark #1
Still mark #2
Still mark #3
Still mark #4
Pointed by Navigation Infomation
Still Images
PlayList
Clip AV Stream
A/V or Audio only

FIG. 5B

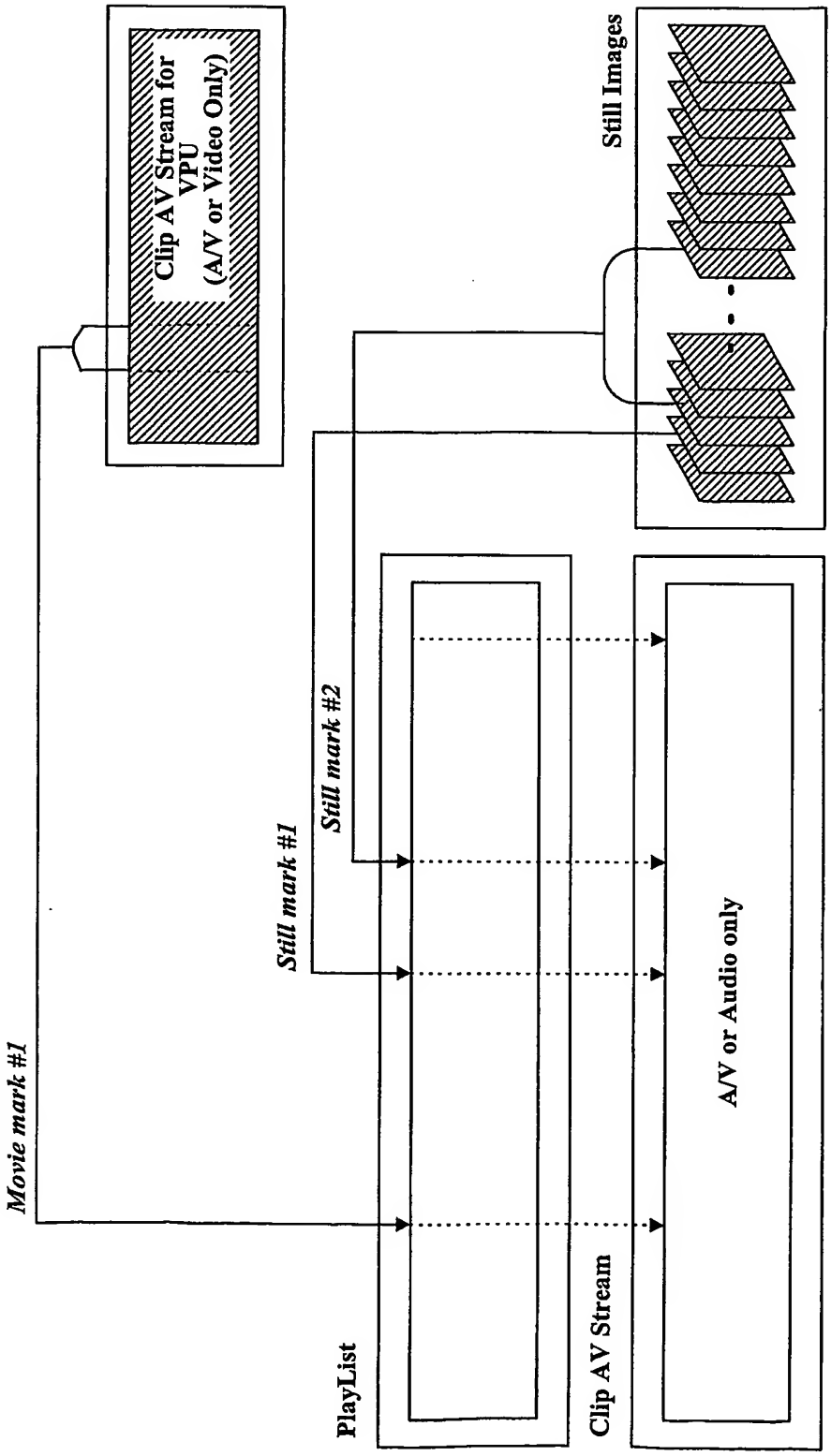

Clip AV Stream for VPU (A/V or Video Only)
Still Images
Movie mark #1
Still mark #1
Still mark #2
PlayList
Clip AV Stream
A/V or Audio only

FIG. 6

Caes 1

```
PlayListMark(){
    length
    number_of_PlayList_marks
    for(i=0; j<number_of_PlayList_marks;j++){
        - - - - -
        mark_type
        - - - - -
        mark_time_stamp

        - - - - -
        ref_to_still_image_index

        duration
        makers_information
        maker_name
        }
}
```

FIG. 7A

Caes 2

```
PlayListMark(){
    length
    number_of_PlayList_marks
    for(i=0; j<number_of_PlayList_marks;j++){
        - - - - -
        mark_type
        - - - - -
        mark_time_stamp

        - - - - -
        ref_to_still_image_index
        duration
        makers_information
        maker_name
        if (mark_type==0x10){
            number_of_still_images
            display_timing_mode
            display_order_mode
            display_effect_mode
            display_effect_period
            }
        }
}
```

FIG. 7B *Movie & Still Mark*

```
PlayListMark(){
    length
    number_of_PlayList_marks
    for(i=0; j<number_of_PlayList_marks;j++){
        mark_type
        mark_time_stamp
        ref_to_still_image_index
        duration
        makers_information
        maker_name
        if (mark_type==0x10){
            number_of_still_images
            display_timing_mode
            display_order_mode
            display_effect_mode
            display_effect_period
            }
        if (mark_type == 0x11){
            VPU_Clip_file_name
            VPU_start_TM
            VPU_end_TM
            VPU_data_size
            VPU_info
        }
}
```

FIG. 7C *Movie Mark*

```
PlayListMark(){
    length
    number_of_PlayList_marks
    for(i=0; j<number_of_PlayList_marks;j++){
        mark_type
        mark_time_stamp
        duration
        makers_information
        maker_name
        }
        if (mark_type == 0x11){
            VPU_Clip_file_name
            VPU_start_TM
            VPU_end_TM
            VPU_data_size
            VPU_info
        }
}
```

FIG. 8A

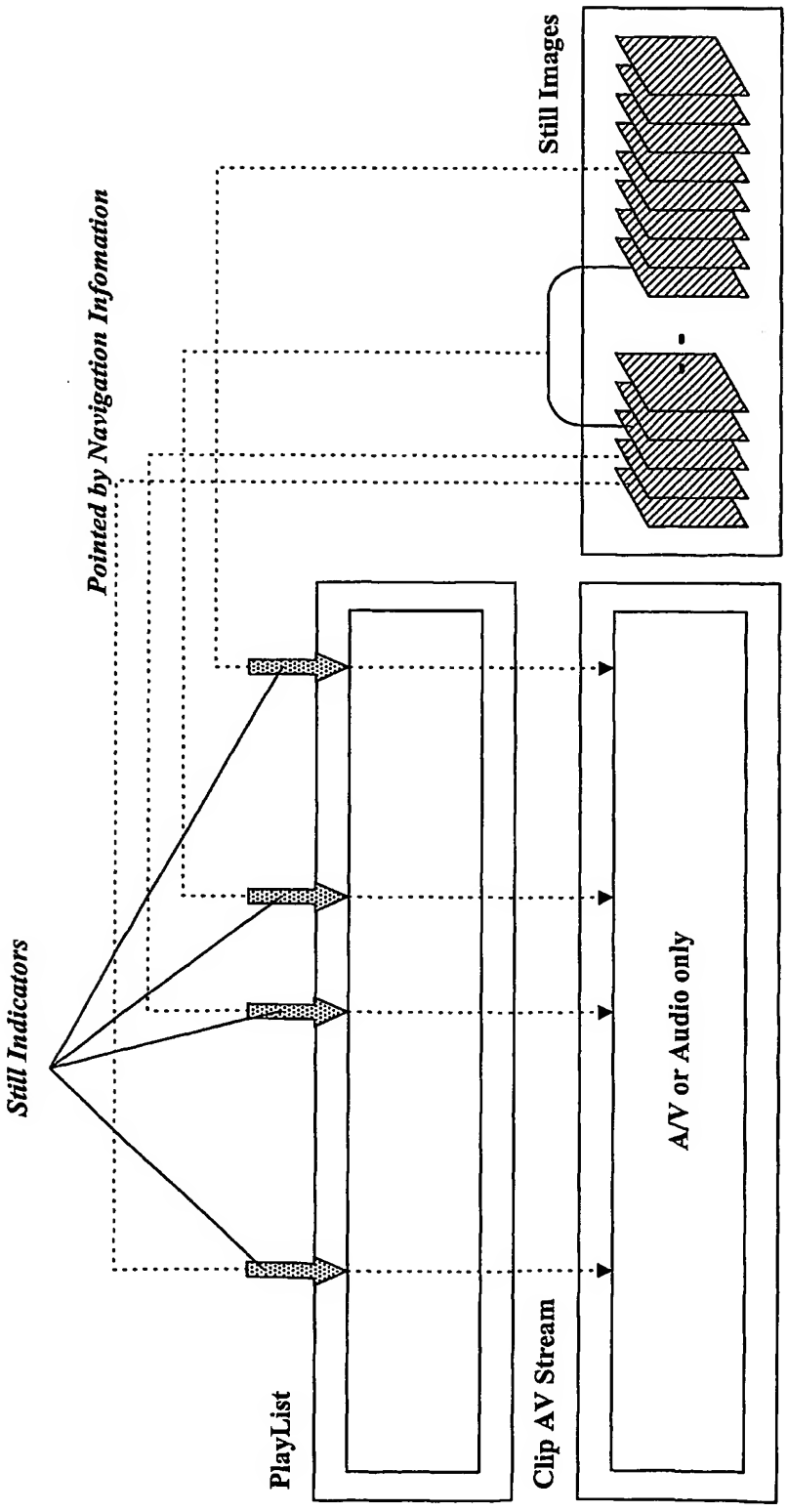
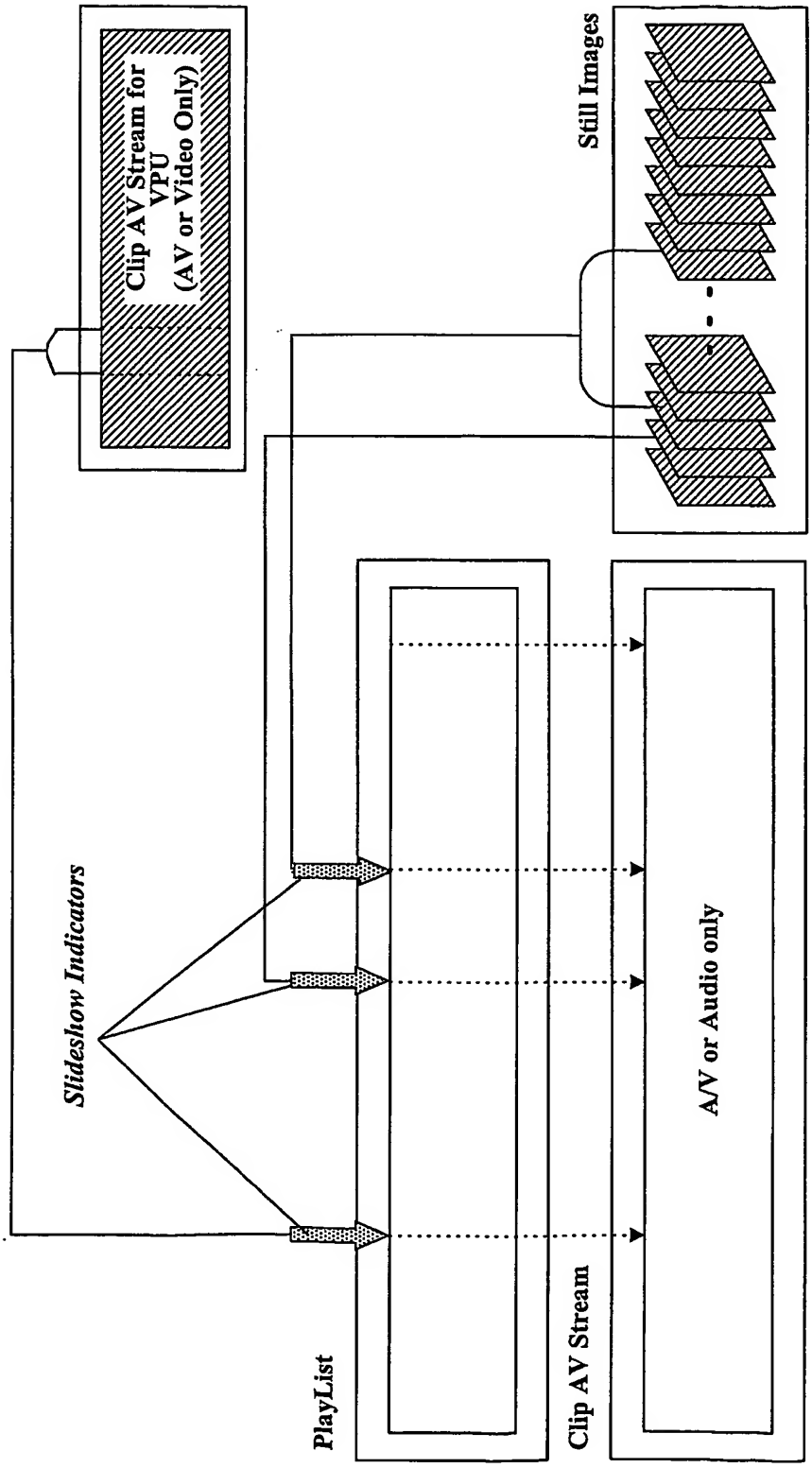

Still Indicators
Pointed by Navigation Infomation
Still Images
PlayList
Clip AV Stream
A/V or Audio only

FIG. 8B


Clip AV Stream for VPU (AV or Video Only)
Still Images
Slideshow Indicators
PlayList
Clip AV Stream
A/V or Audio only

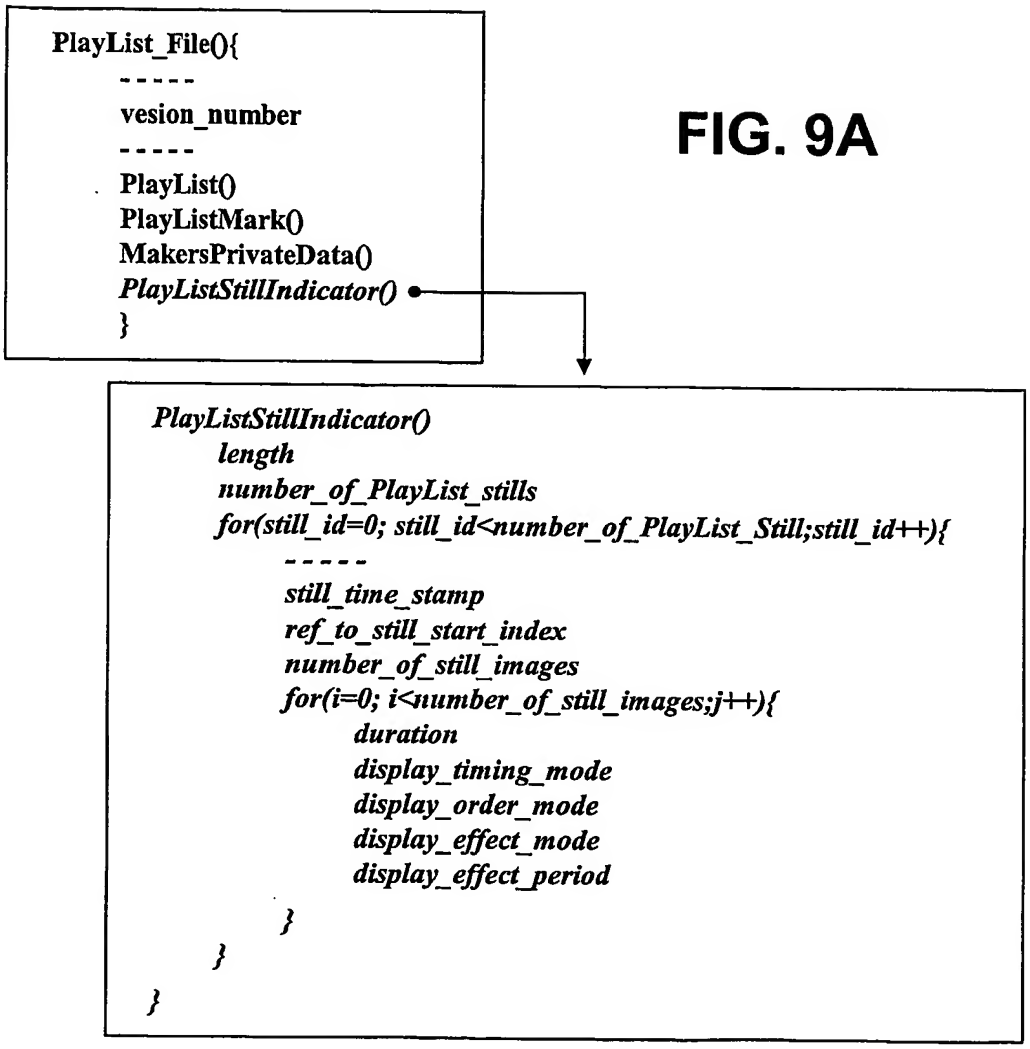

PlayList_File(){
- - - - -
vesion_number
- - - - -
PlayList()
PlayListMark()
MakersPrivateData()
PlayListStillIndicator()
}
PlayListStillIndicator()
length
number_of_PlayList_stills
for(still_id=0; still_id<number_of_PlayList_Still;still_id++){
- - - - -
still_time_stamp
ref_to_still_start_index
number_of_still_images
for(i=0; i<number_of_still_images;j++){
duration
display_timing_mode
display_order_mode
display_effect_mode
display_effect_period
}
}
}

FIG. 9A

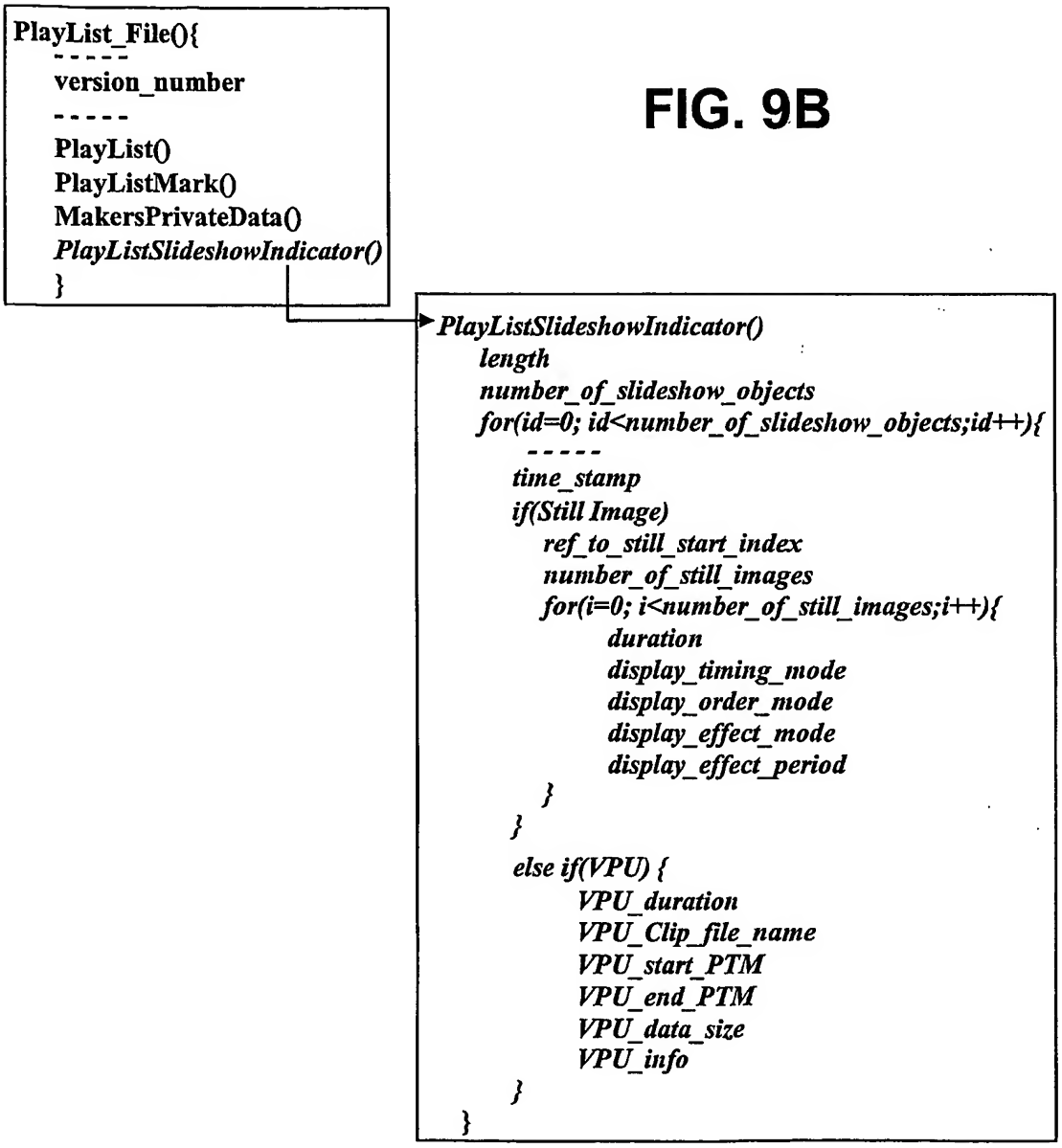

PlayList_File(){
- - - - -
version_number
- - - - -
PlayList()
PlayListMark()
MakersPrivateData()
PlayListSlideshowIndicator()
}
PlayListSlideshowIndicator()
length
number_of_slideshow_objects
for(id=0; id<number_of_slideshow_objects;id++){
- - - - -
time_stamp
if(Still Image)
ref_to_still_start_index
number_of_still_images
for(i=0; i<number_of_still_images;i++){
duration
display_timing_mode
display_order_mode
display_effect_mode
display_effect_period
}
}
else if(VPU) {
VPU_duration
VPU_Clip_file_name
VPU_start_PTM
VPU_end_PTM
VPU_data_size
VPU_info
}
}

FIG. 9B

FIG. 10

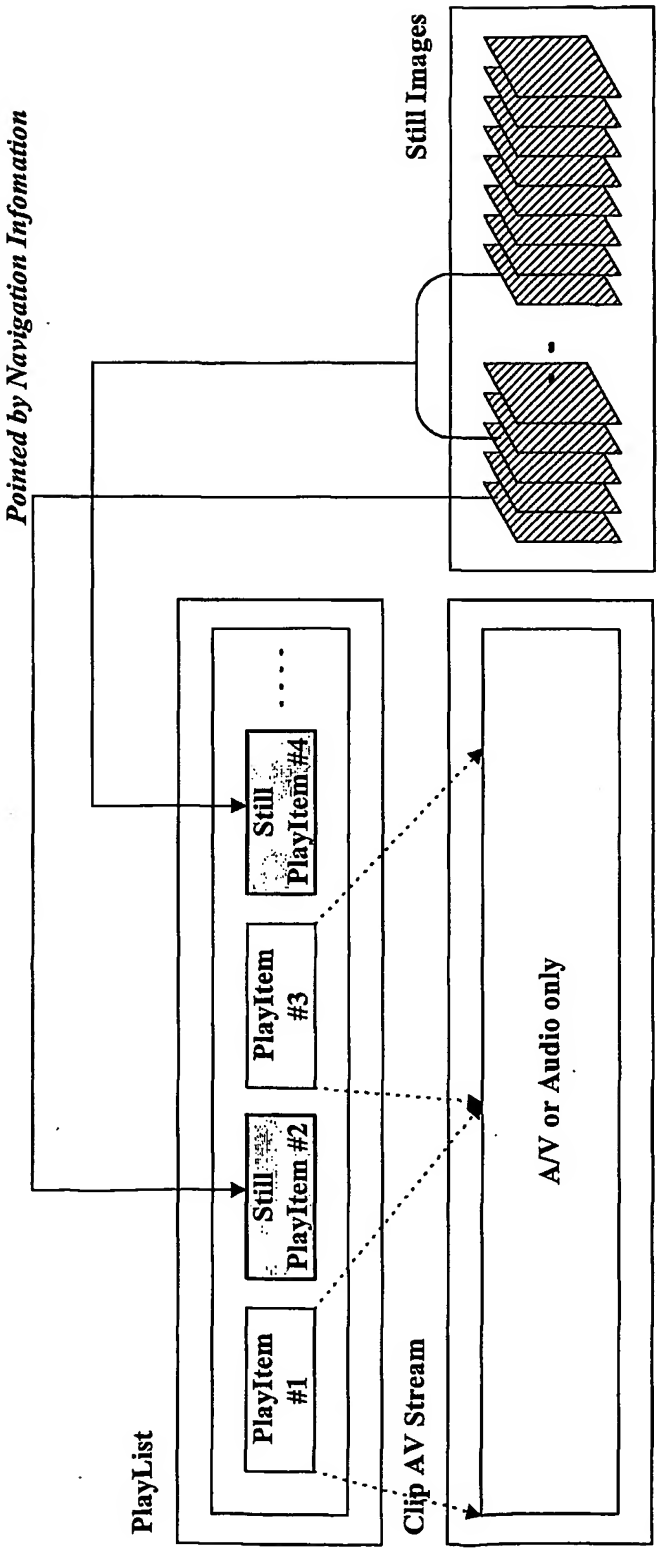

Pointed by Navigation Infomation
Still Images
PlayList
PlayItem #1
Still PlayItem #2
PlayItem #3
Still PlayItem #4
Clip AV Stream
A/V or Audio only

FIG. 11A

```
PlayItem(){
    length
    Clip_Information_file_name
    Clip_codec_identifier
    if (CPI_type = 1)
        ref_to_STC_id
            :
    IN_time
    Out_time
            :
    }
    if (<Still-Image>) {
        for (i=0; j<number_of_still_images; j++){
            duration
            display_timing_mode
            display_order_mode
            display_effect_mode
            display_effect_period
        }
    }
}
```

FIG. 11B

```
PlayItem(){
    length
    Clip_Information_file_name
    Clip_codec_identifier
    if (CPI_type = 1)
        ref_to_STC_id
            :
    if (VPU) {
        VPU duration
        VPU_Clip_file_name
        VPU_start_PTM
        VPU_end_PTM
        VPU_info
    }
}
```

FIG. 12A

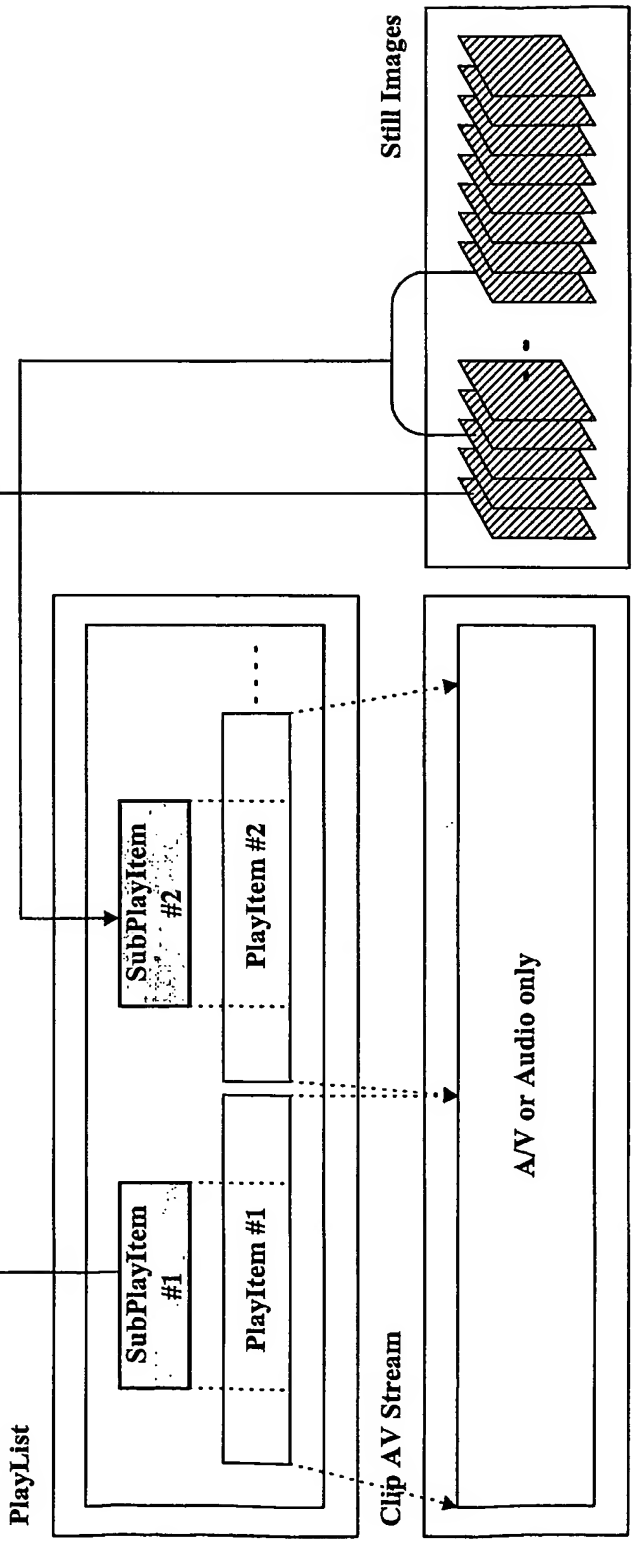

Still Images
Pointed by Navigation Infomation
PlayList
SubPlayItem #1
SubPlayItem #2
PlayItem #1
PlayItem #2
Clip AV Stream
A/V or Audio only

FIG. 12B

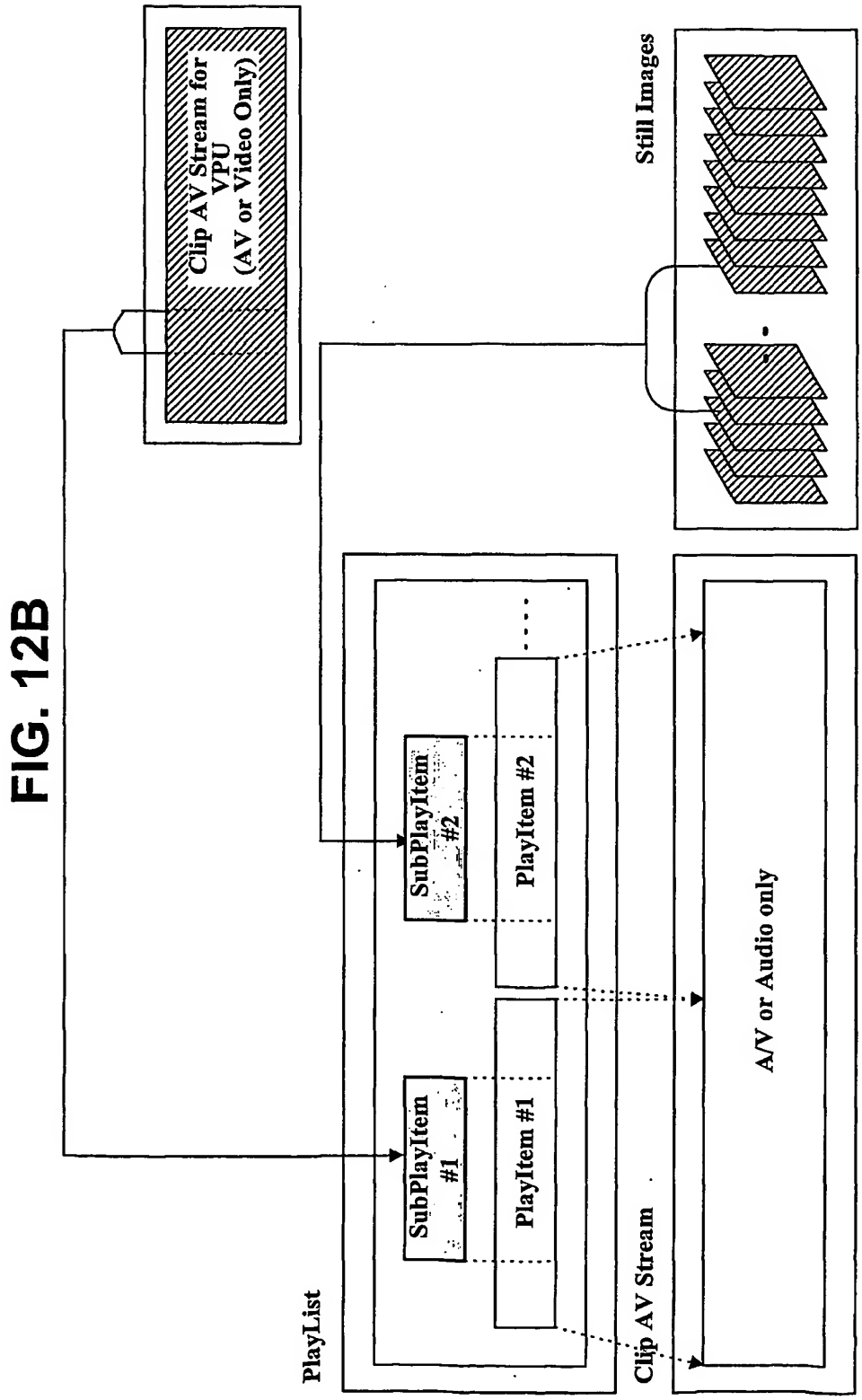

Clip AV Stream for VPU (AV or Video Only)
Still Images
PlayList
SubPlayItem #1
PlayItem #1
SubPlayItem #2
PlayItem #2
Clip AV Stream
A/V or Audio only

FIG. 13A

```
SubPlayItem(){
    length
    Clip_Information_file_name
    Clip_codec_identifier
    SubPlayItem_type
    ref_to_STC_id
    SubPlayItem_IN_time
    SubPlayItem_Out_time
    sync_PlayItem_id
    Sync_start_PTS_of_PlayItem
    if (<Still-Image>) {
        number_of_still_images
        for (i=0; j<number_of_still_images; j++){
            duration
            display_timing_mode
            display_order_mode
            display_effect_mode
            display_effect_period
        }
    }
}
```

FIG. 13B

```
SubPlayItem(){
    length
    Clip_Information_file_name
    Clip_codec_identifier
    SubPlayItem_type
    ref_to_STC_id
    SubPlayItem_IN_time
    SubPlayItem_Out_time
    sync_PlayItem_id
    Sync_start_PTS_of_PlayItem
    if (<Still-Image>) {
        number_of_still_images
        for (i=0; j<number_of_still_images; j++){
            duration
            display_timing_mode
            display_order_mode
            display_effect_mode
            display_effect_period
        }
    }
    if (<VPU>) {
        VPU_data_size
        VPU_info
    }
}
```

FIG. 14A

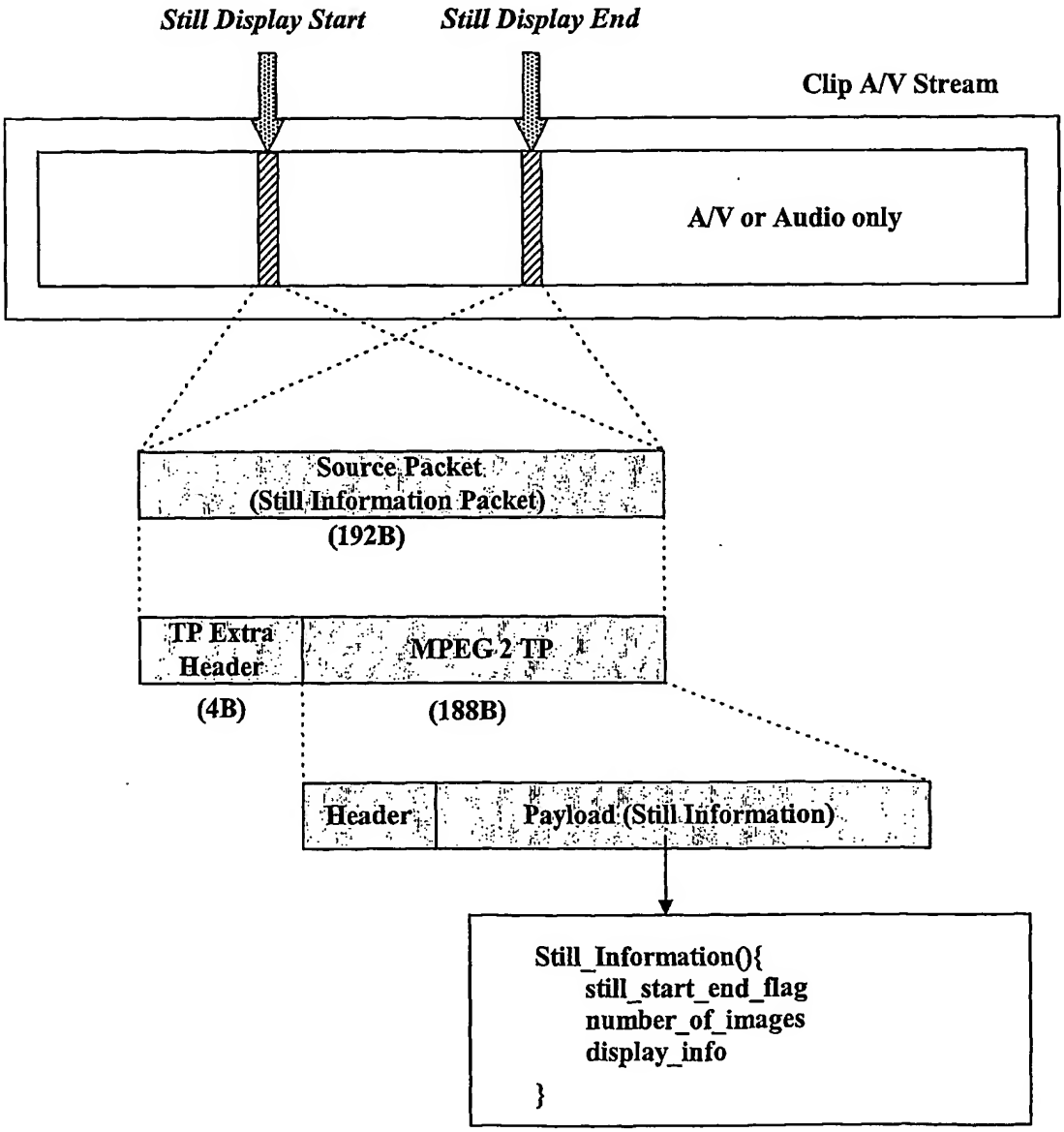

Still Display Start
Still Display End
Clip A/V Stream
A/V or Audio only
Source Packet
(Still Information Packet)
(192B)
TP Extra Header
(4B)
MPEG-2 TP
(188B)
Header
Payload (Still Information)
Still_Information(){
still_start_end_flag
number_of_images
display_info
}

FIG. 14B

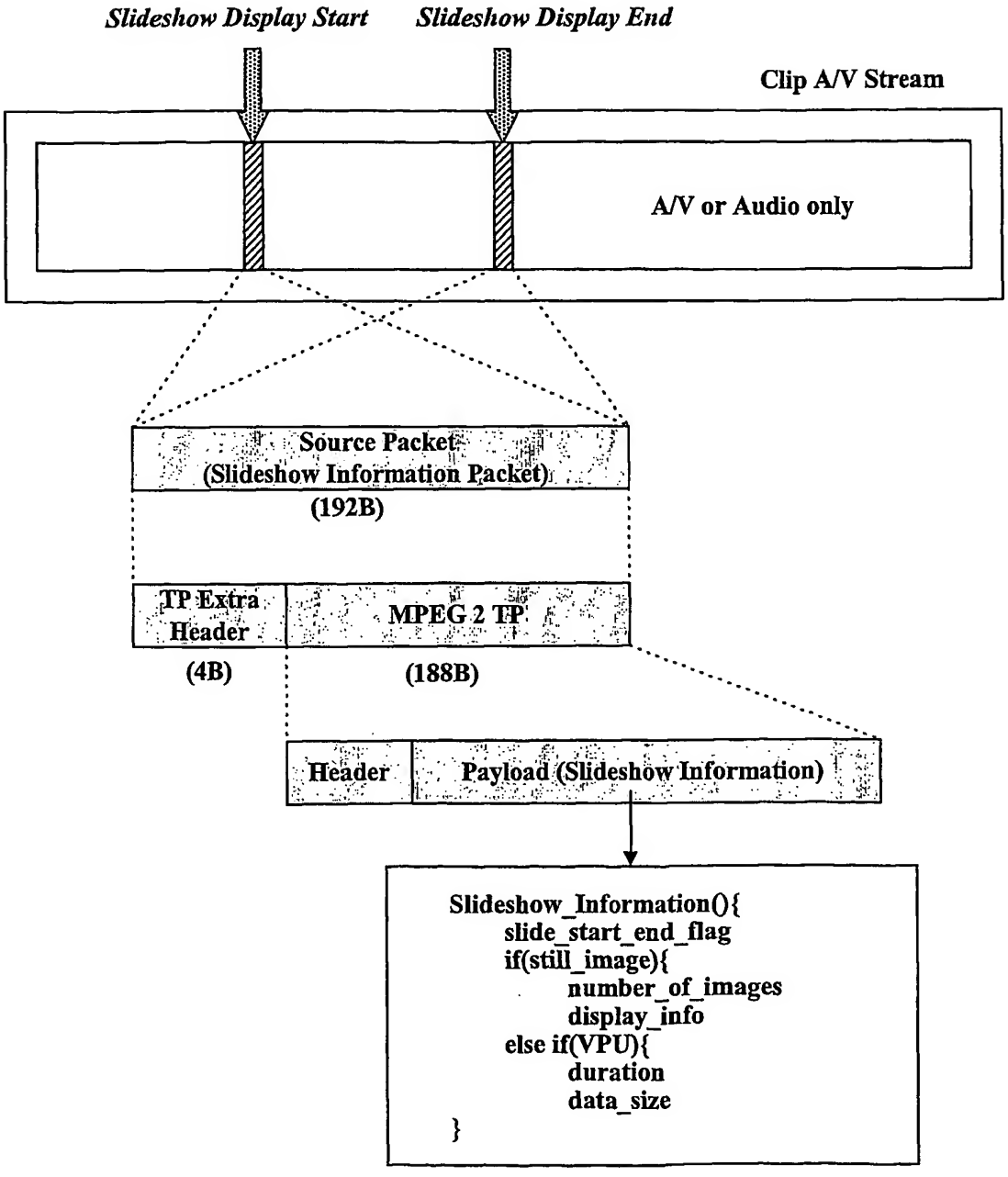

Slideshow Display Start
Slideshow Display End
Clip A/V Stream
A/V or Audio only
Source Packet
(Slideshow Information Packet)
(192B)
TP Extra Header
(4B)
MPEG 2 TP
(188B)
Header
Payload (Slideshow Information)
Slideshow_Information(){
slide_start_end_flag
if(still_image){
number_of_images
display_info
else if(VPU){
duration
data_size
}

FIG. 15

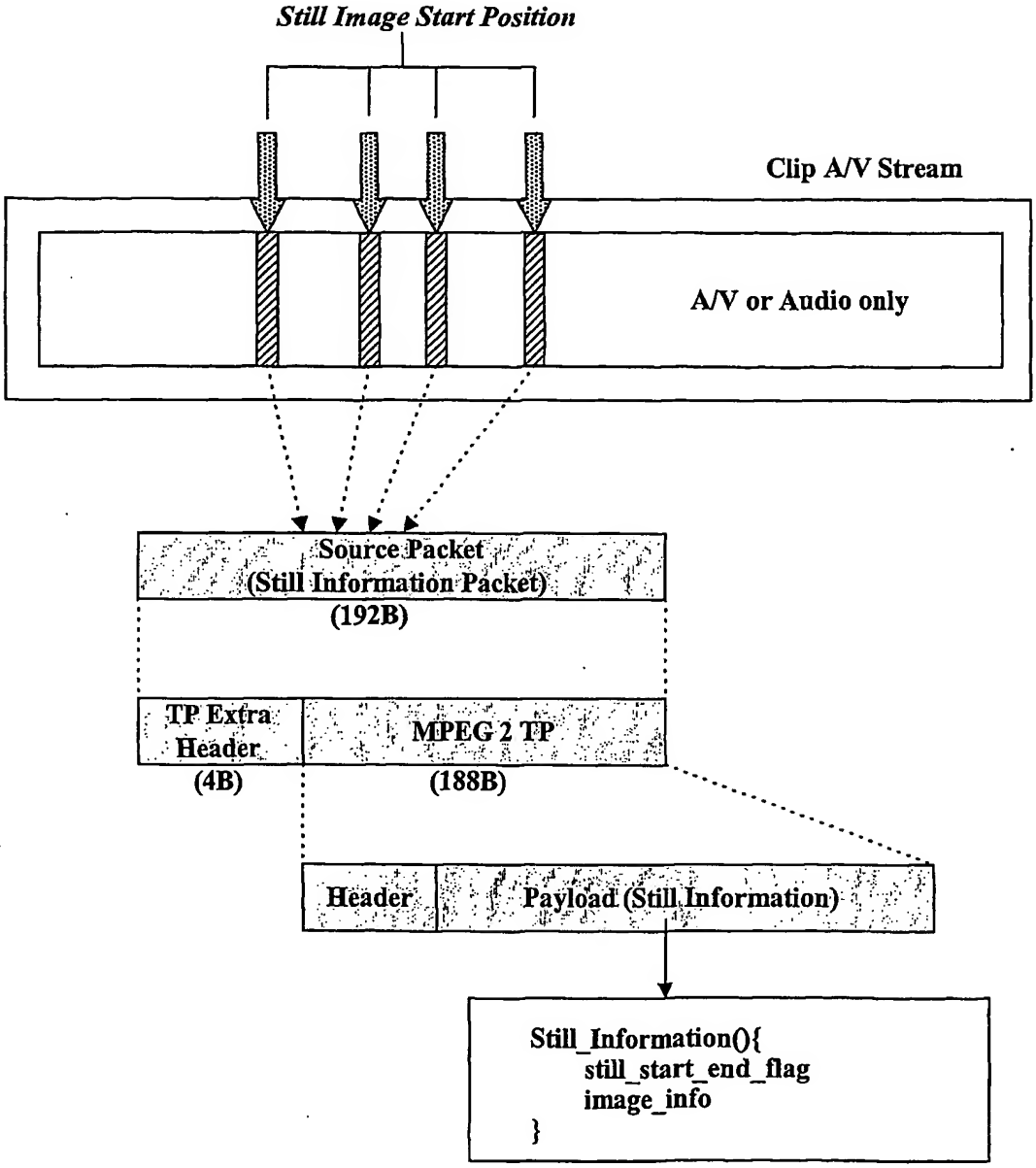

Still Image Start Position
Clip A/V Stream
A/V or Audio only
Source Packet
(Still Information Packet)
(192B)
TP Extra Header
(4B)
MPEG 2 TP
(188B)
Header
Payload (Still Information)
Still_Information(){
still_start_end_flag
image_info
}

FIG. 16

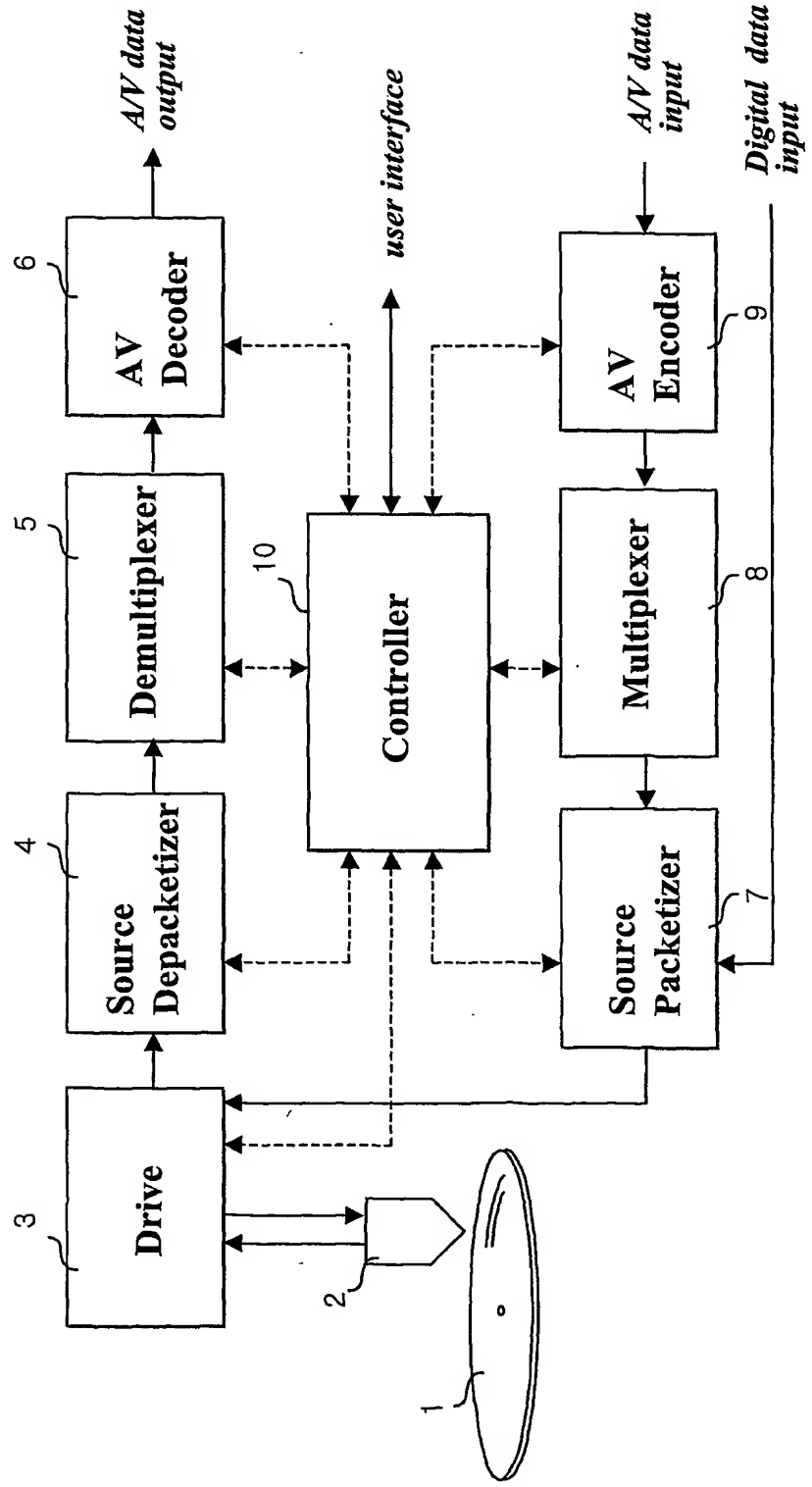

A/V data output
user interface
A/V data input
Digital data input
6
AV Decoder
9
AV Encoder
5
Demultiplexer
10
Controller
8
Multiplexer
4
Source Depacketizer
7
Source Packetizer
3
Drive
2
1

FIG. 17

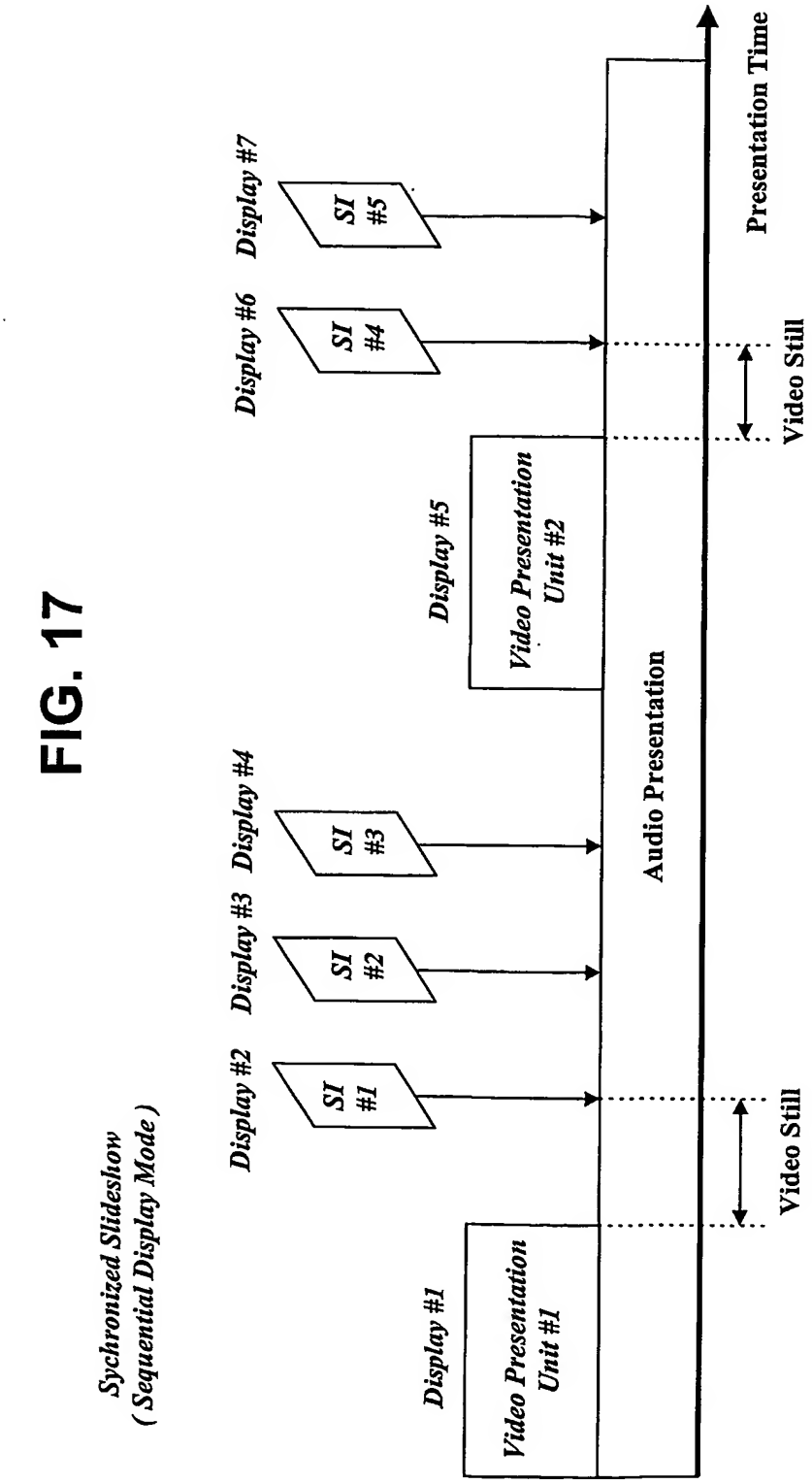

Sychronized Slideshow
(Sequential Display Mode)
Display #1
Video Presentation Unit #1
Display #2
SI #1
Display #3
SI #2
Display #4
SI #3
Display #5
Video Presentation Unit #2
Display #6
SI #4
Display #7
SI #5
Audio Presentation
Video Still
Video Still
Presentation Time

FIG. 18

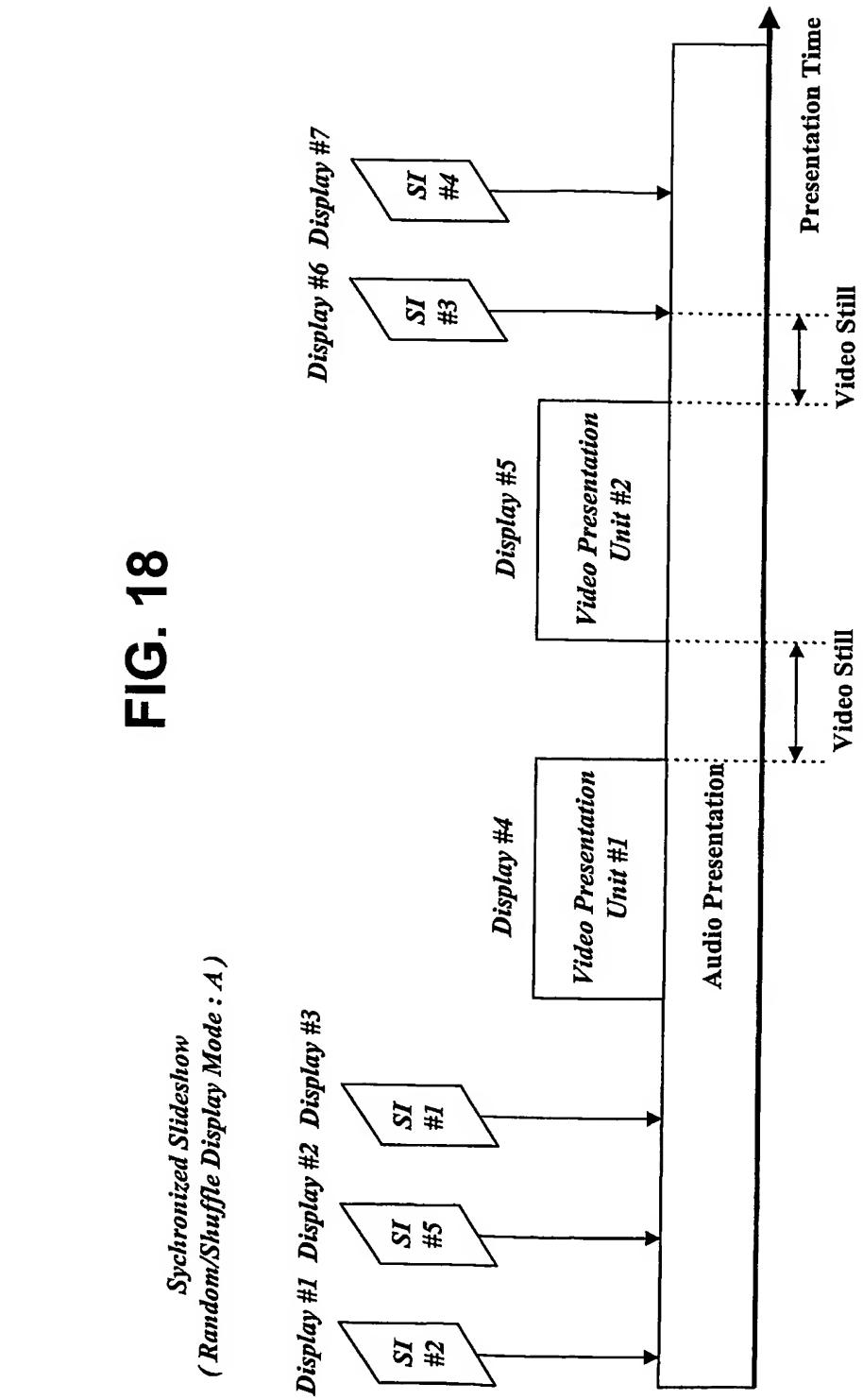

Sychronized Slideshow
(Random/Shuffle Display Mode : A)
Display #1
Display #2
Display #3
SI #2
SI #5
SI #1
Display #4
Video Presentation Unit #1
Display #5
Video Presentation Unit #2
Display #6
Display #7
SI #3
SI #4
Audio Presentation
Video Still
Video Still
Presentation Time

FIG. 19

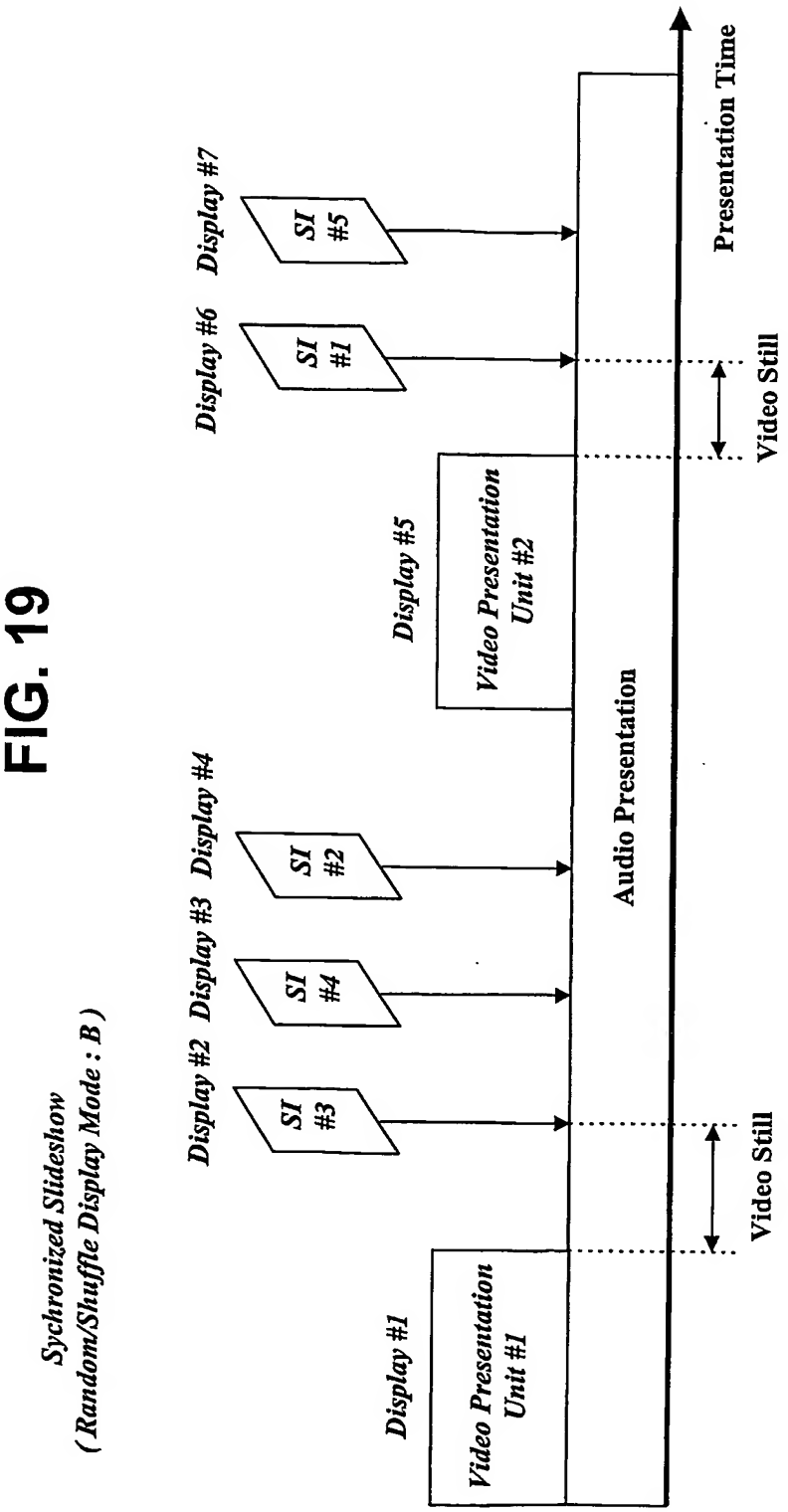
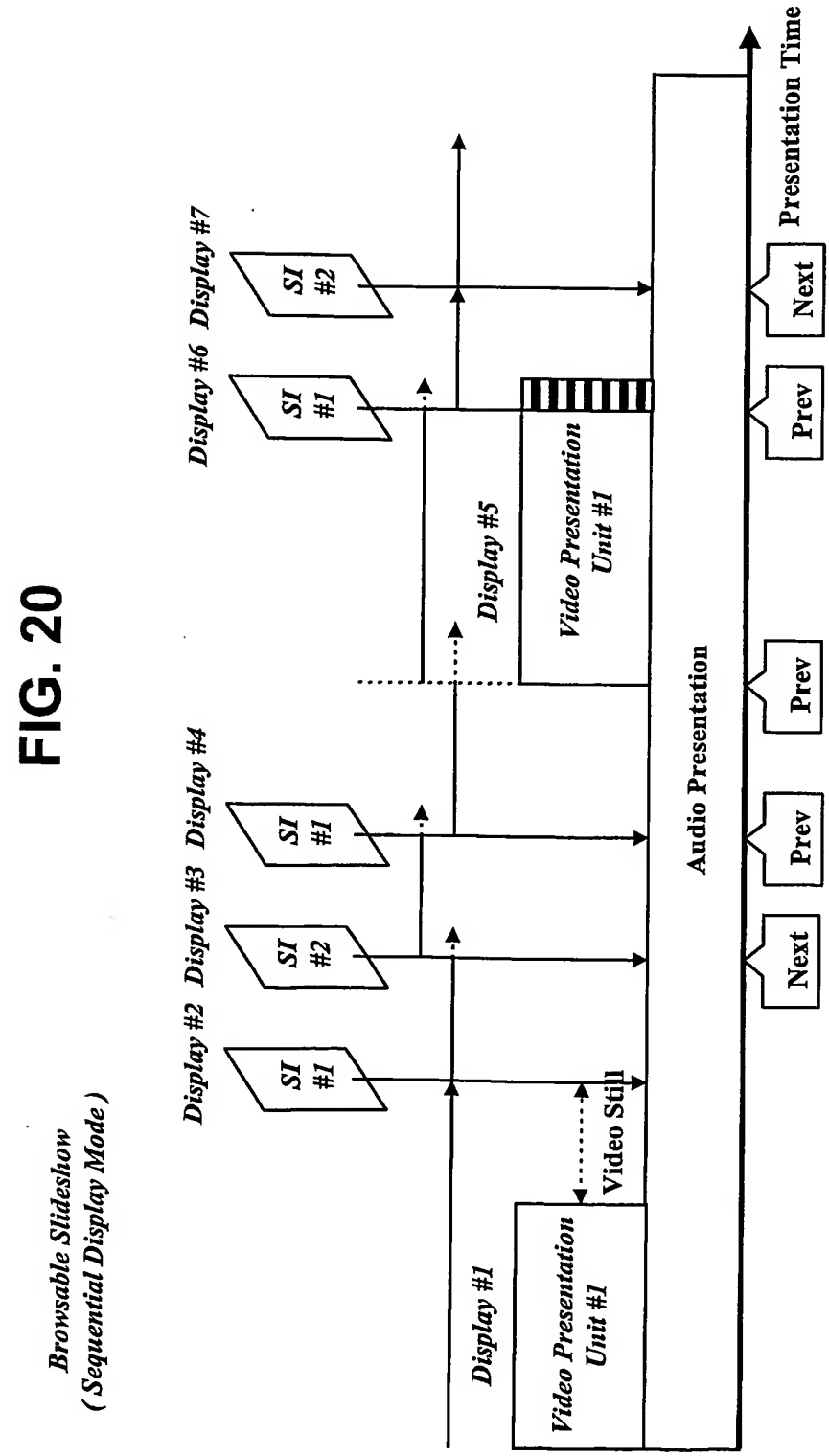

Sychronized Slideshow
(Random/Shuffle Display Mode : B)
Display #1
Video Presentation Unit #1
Display #2
SI #3
Display #3
SI #4
Display #4
SI #2
Display #5
Video Presentation Unit #2
Display #6
SI #1
Display #7
SI #5
Audio Presentation
Video Still
Video Still
Presentation Time

FIG. 20


Browsable Slideshow
(Sequential Display Mode)
Display #1
Video Presentation Unit #1
Video Still
Display #2
SI #1
Display #3
SI #2
Display #4
SI #1
Display #5
Video Presentation Unit #1
Display #6
SI #1
Display #7
SI #2
Audio Presentation
Next
Prev
Prev
Prev
Next
Presentation Time

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR03/01799

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 G11B 20/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G11B 20/12 19/02 20/10 27/10

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 9-17101 A (TOSHIBA CORP) 17 JANUARY 1997 SEE TH E WHOLE DOCUMENT	1, 12
A	EP 1 113 439 A (SAMSUNG ELECTRONICS) 4 JULY 2001 SEE THE WHOLE DOCUMENT	1, 12
A	EP 1 045 393 A (SONY CORP) 18 OCTOBER 2000 SEE THE WHOLE DOCUMENT	1, 12

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"E" earlier application or patent but published on or after the international filing date
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 DECEMBER 2003 (23.12.2003)	24 DECEMBER 2003 (24.12.2003)

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Form PCT/ISA/210 (second sheet) (July 1998)